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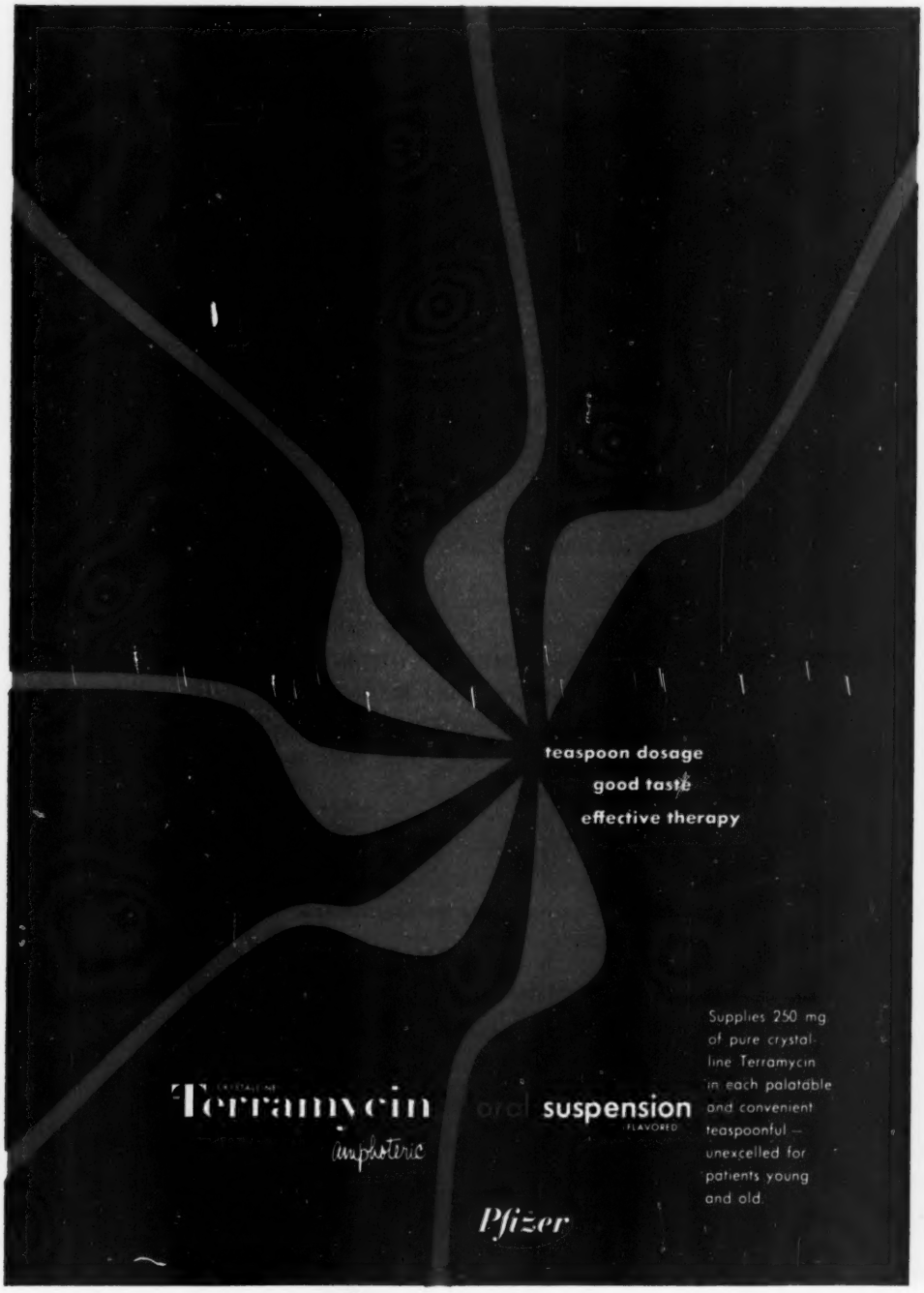

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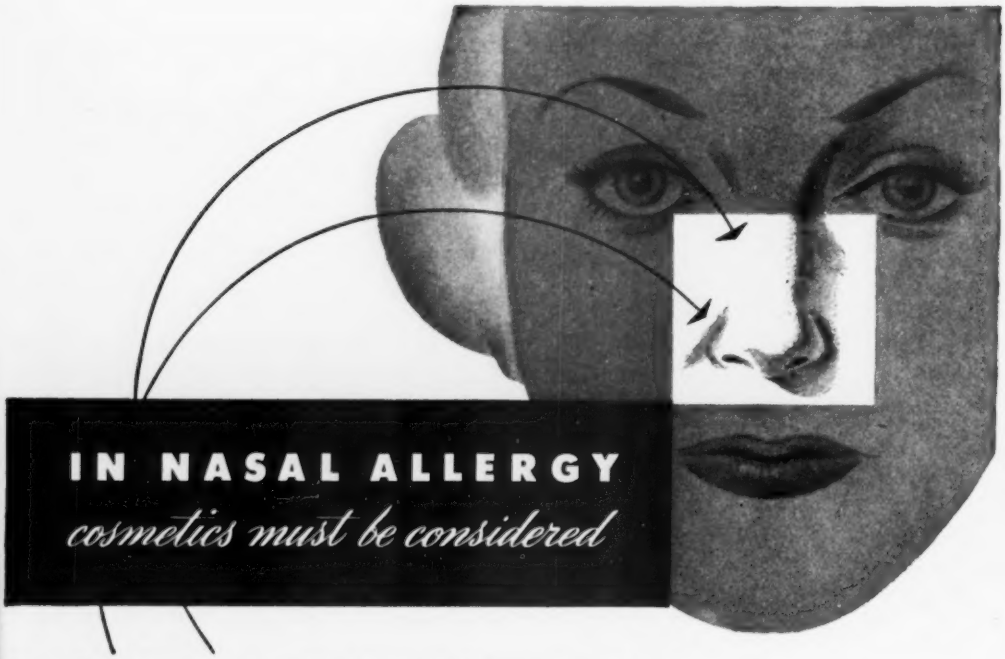

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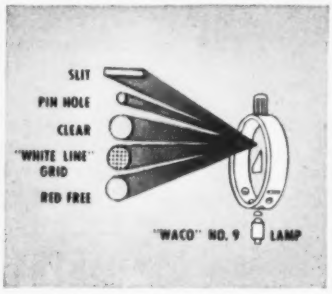

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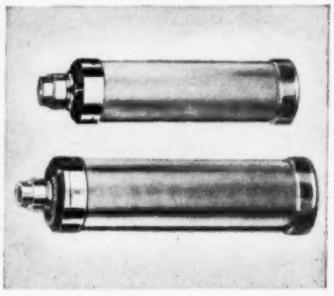

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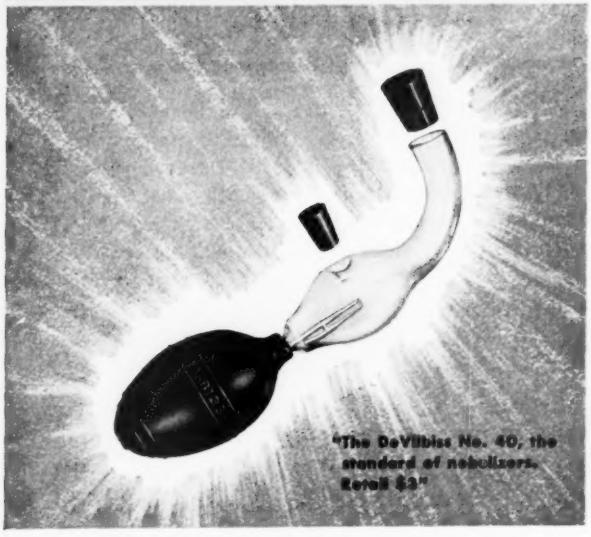

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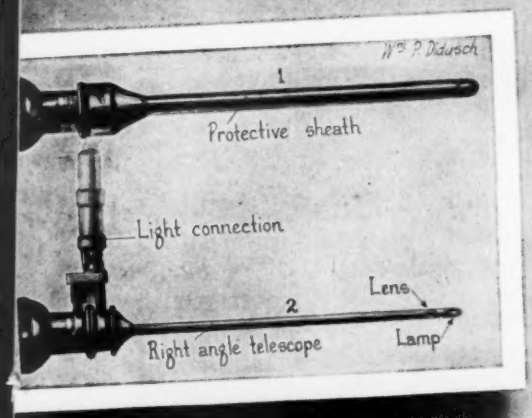

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LARYNGEAL MANIFESTATIONS OF INTRATHORACIC CONDITIONS

LEON L. TITCHE, M.D.
TUCSON, ARIZ.

SINCE the larynx is situated above and outside of the chest, one would suppose that intrathoracic lesions would involve the larynx infrequently and only by an ascending infection being carried by continuity of the mucous membrane or by the respiratory air column. But, when the laryngeal nerve supply is remembered, the effect of abnormalities within the thorax upon these nerves and thereby upon the larynx easily can be surmised. The laryngeal manifestation of this is evidenced by an alteration in the quality of the voice. This ranges from slight huskiness to almost complete aphonia, though at times there may be no clinical signs of dysfunction. This presentation will show several instances of these conditions.

Before the discussion proceeds further, a brief review of the nerve supply of the vocal cords may give a clearer picture (Fig. 1). The cricothyroid muscle receives its innervation by way of the superior laryngeal nerve which arises from the vagus opposite the upper border of the larynx. The remainder of the muscles are supplied by the recurrent laryngeal nerve, and because of this situation paralysis is not infrequent. These nerves are motor fibers of the spinal accessory nerve which descend in the vagus. On the right side the recurrent nerve leaves the vagus at the level of and in front of the subclavian artery, loops around this vessel, and then ascends along the side of the trachea to the lower border of the larynx. The left recurrent nerve is given off from the vagus lower down than on the right, loops around the arch of the aorta from front to back, and also ascends along the side of the trachea to the larynx. Williams [1] found that the recurrent laryngeal nerves divide extralaryngeally into motor and sensory branches and not into adductor and abductor branches and that there are no communications between the nerves of the two sides of the larynx. Work [2] reported a case in which the right recurrent nerve passed directly from the vagus at the level of the larynx into that organ.

MacKenzie [3] pointed out, a number of years ago, that paralysis of one of the recurrent laryngeal nerves from local mechanical causes is not uncommon, owing

From the Eye, Ear, Nose, and Throat Section (Dr. Titche, Chief), Veterans Administration Hospital.

Read at the 36th Annual Meeting of the Pacific Coast Oto-Ophthalmological Society, Salt Lake City, April 27, 1952.

Reviewed by the Veterans Administration and published with the approval of the Chief Medical Director. The statements and conclusions published by the author are the result of his own study and do not necessarily reflect the opinion or policy of the Veterans Administration.

1. Williams, A. F.: The Nerve Supply of the Laryngeal Muscles, J. Laryng. & Otol. **65**:343-348 (May) 1951.

2. Work, W. P.: Unusual Position of the Right Recurrent Laryngeal Nerve, Ann. Otol. Rhin. & Laryng. **50**:769-775 (Sept.) 1941.

3. MacKenzie, M.: Diseases of the Pharynx, Larynx and Trachea, New York, William Wood & Company, 1880, p. 324.

to the long course pursued by the main trunks of the nerves. Jackson and Jackson [4] have compared this to what a telephone engineer would call a "wire-trouble zone." They estimate that recurrent paralysis would not occur half so often if the recurrent fibers entered the larynx close to the point where they are given off from the vagus. They believe this bad routing to be atavistic in origin.

Semon, in 1881, published his work on laryngeal paralysis and theorized the proclivity to injury of the abductor fibers in the nerve to the adductor fibers. Brocklehurst and Edgeworth [5] found that the maximum diameters of both the motor and the sensory medullated fibers are the same. Lapp [6] stated that Russell had shown that the abductor and adductor filaments exist as separate bundles in the nerve. Murtagh and Campbell [7] made an extensive study of the recurrent laryngeal

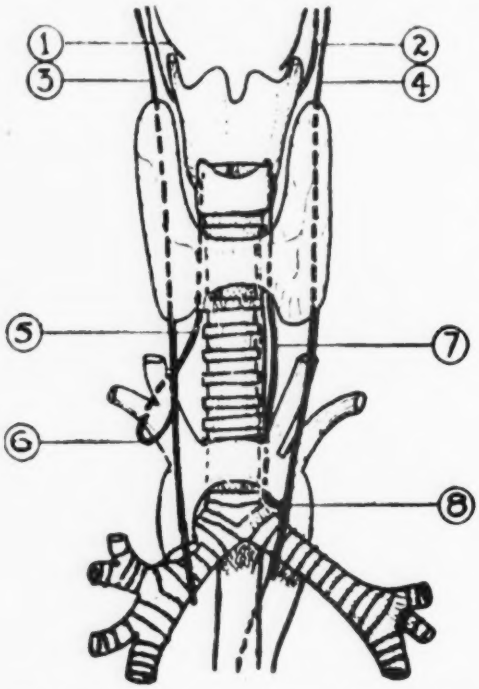

Fig. 1.—Nerve supply of the larynx: *1*, right superior laryngeal nerve, internal sensory branch; *2*, left superior laryngeal nerve, external motor branch; *3*, right vagus nerve; *4*, left vagus nerve; *5*, right recurrent laryngeal nerve; *6*, right recurrent laryngeal nerve winding around right subclavian artery; *7*, left recurrent laryngeal nerve; *8*, left recurrent laryngeal nerve winding around arch of aorta (from Morrison, W. W.: Diseases of the Nose, Throat and Ear, Philadelphia, W. B. Saunders Company, 1938).

4. Jackson, C., and Jackson, C. L.: Diseases and Injuries of the Larynx, Ed. 2, New York, The Macmillan Company, 1942, p. 321.

5. Brocklehurst, R. J., and Edgeworth, F. H.: The Fibre Components of the Laryngeal Nerves of Macaca Mulatta, J. Anat. **74**:386-389 (April) 1940.

6. Lapp, V. R.: Paresis of the Larynx, Canad. M. A. J. **45**:239-241 (Sept.) 1941.

7. Murtagh, J. A., and Campbell, C. J.: The Respiratory Function of the Larynx, Ann. Otol. Rhin. & Laryng. **57**:464-472 (June) 1948; The Respiratory Function of the Larynx: Relation of Fibre Size to Function in Recurrent Laryngeal Nerve, Laryngoscope **61**:581-590 (July) 1951.

nerve and found by microscopic sections and chronaxie measurements that the large bundles in the nerve supply the adductor muscles. The smaller and less heavily medullated fibers supply the abductor muscles. They presumed that these would be more readily injured by chemical or mechanical agents.

Being in close anatomical relationship to many other structures within the thorax, the recurrent laryngeal nerves are affected by alterations in these structures. The right recurrent nerve can be affected by an aneurysm of the right subclavian artery, as reported by Shea.[8] Habif [9] found involvement due to an aneurysm of the right vertebral artery. The left nerve is involved in aneurysm of the aorta. Diefenbach [10] reported two cases of hypertensive heart disease, with left vocal cord paralysis. Alpert,[11] Lutembacher,[12] and Plotz and Brooks [13] found involvement of the left nerve in mitral stenosis due either to pressure by the dilated left auricle and pulmonary vessels or to inflammation of the nerve itself. Erlanger and Levine [14] observed paralysis in two cases of atrial-septal defect. Cancers of the structures in proximity to the nerves involve the latter by pressure.

Inflammatory conditions and infections give rise to the majority of the cases of paralysis. The left nerve is more frequently involved than the right. Woodward [15] believes that its longer course accounts for the frequent involvement. Freedman [16] reported the occurrence of paralysis in a case of lung abscess following pneumonia. In pulmonary tuberculosis laryngeal involvement not due to direct infection is not infrequent. This ranges from paresis of a cord to complete paralysis. This is the result of pressure, inflammatory changes in the nerve, or disruption of continuity. In the first instance laryngeal nerve involvement can be produced by fibrotic changes in the lung or enlarged mediastinal glands, as reported by Myerson.[17] Champeaux and Adrian [18] found that pneumothorax causes a compression and stretching of the nerve. As for the second cause, Lake [19] believed it to be a toxic one. Berner,[20]

8. Shea, J. J.: Paralysis of the Right Vocal Cord, Laryngoscope **53**:184-185 (March) 1943.

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17. Myerson, M. C.: Tuberculosis of the Ear, Nose and Throat, Springfield, Ill., Charles C Thomas, Publisher, 1944, p. 70.

18. Champeaux, D., and Adrian, E.: Laryngeal Paralysis Provoked by Pneumothorax, Ann. oto-laryng. **64**:196-198 (March-April) 1947.

19. Lake, R.: Laryngeal Phthisis, London, Rebman, Ltd., 1901, p. 17.

20. Berner, A.: Recurrent Paralysis from Tuberculous Neuritis, Pract. oto-rhino-laryng. **6**:30-34, 1944.

Klebanova and Filatova,[21] and Piaget and Seguin [22] found inflammatory changes in the nerve, with loss of continuity of the fibers. The latter also has been seen by Work [23] after total pneumonectomy and by Piaget and Seguin [22] after apicolysis and the severing of pleural adhesions.

The position which the affected cord assumes in complete paralysis has been the subject of much controversy. New and Childrey [24] state that the cord is in the median or paramedian position, and Hofer and Jeschek [25] agree with them, as does Murtagh.[26] Clerf and Suehs [27] conclude that initially there may be a brief period of full adduction followed by partial adduction and that finally the median position is assumed, a cord in the midline not assuming the cadaveric position later. Phelps [28] believes that the cadaveric position occurs first and that later the cord is in the midline position. This is due to total paralysis of the recurrent nerve, and the paralysis should not be called "abductor paralysis." Lawson [29] believes that the paralysis is of the abductor type. Negus [30] found that in complete paralysis of the recurrent nerve the paramedian position is taken up and that the cadaveric position occurs only when both the superior and the recurrent laryngeal nerves are involved.

REPORT OF CASES

Representative cases of laryngeal dysfunction produced by intrathoracic conditions will now be considered.

Vocal Cord Paralysis Due to Pulmonary Tumor.—CASE 1.—C. W. P., a white man 53 years of age, had paralysis of the left vocal cord. The patient was admitted complaining of cough, hoarseness, blood-streaked sputum, chest pain, and loss of weight, all of two months' duration. A roentgenogram (Fig. 2*A*) shows a large nodular mass which fills the entire left apex. Bronchoscopy did not show any evidence of tumor, and examination of aspirated secretions did not reveal any tumor cells. Exploratory thoracotomy revealed fixation of the left upper lobe to the apex of the thorax and vertebral column. Left pneumonectomy was performed, and tissue examination revealed anaplastic epidermoid carcinoma.

Vocal Cord Paralysis Due to Suspected Tumor.—CASE 2.—C. H. K., a white man 55 years of age, had paralysis of the right vocal cord. The patient was admitted to the hospital, with

21. Klebanova, A. A., and Filatova, A. G.: Detection of Tubercle-Bacilli in Nervous Tissue of Patients with Laryngeal-Pulmonary Tuberculosis, abstracted, Bull. Hyg. **22**:506 (Aug.) 1947.

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25. Hofer, C., and Jeschek, J.: Paralysis of the Recurrent Laryngeal Nerve in Human Beings, Ztschr. Hals-, Nasen- u. Ohrenh. **45**:401 (June) 1940.

26. Murtagh, J. A.: The Respiratory Function of the Larynx: Some Observations on Laryngeal Innervations: Preliminary Report, Ann. Otol. Rhin. & Laryng. **54**:307-321 (June) 1945.

27. Clerf, L. H., and Suehs, O. W.: Paralysis of the Larynx, Ann. Otol. Rhin. & Laryng. **50**:762-768 (Sept.) 1941.

28. Phelps, K.: Laryngeal Palsy, Minnesota Med. **26**:566-568 (June) 1943.

29. Lawson, L. J.: The Superior and Recurrent Laryngeal Nerves, Quart. Bull. Northwestern Univ. M. School **22**:356-359, 1948.

30. Negus, V. E.: Certain Anatomical and Physiological Considerations in Paralysis of the Larynx, Proc. Roy. Soc. Med. **40**:849-853 (Dec.) 1947.

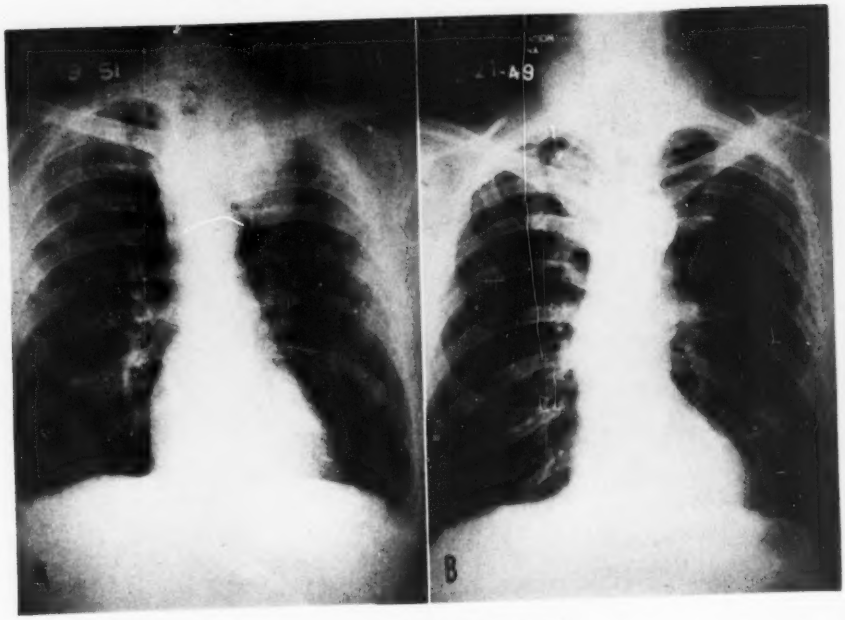

Fig. 2.—*A*, Case 1. *B*, Case 2.

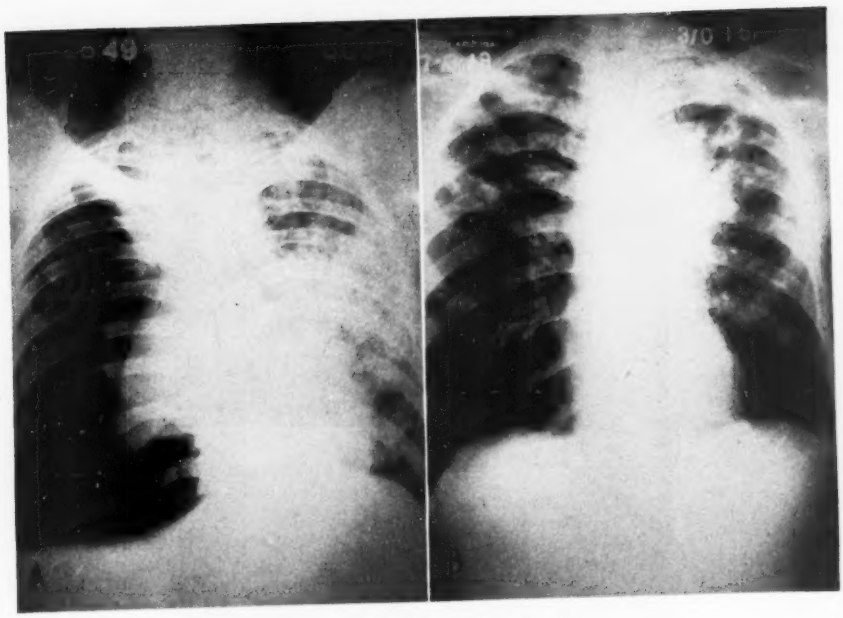

Fig. 3.—*A*, Case 3. *B*, Case 4.

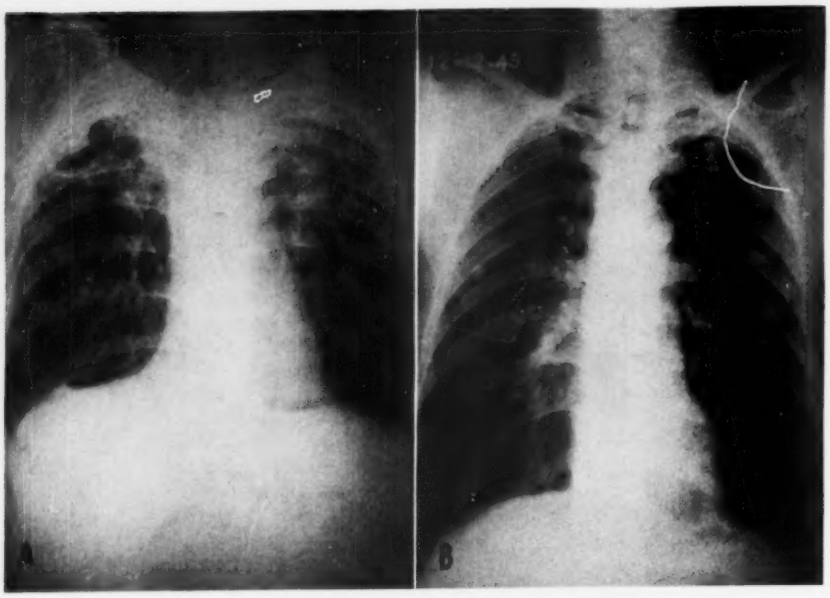

Fig. 4.—*A*, Case 5. *B*, Case 6.

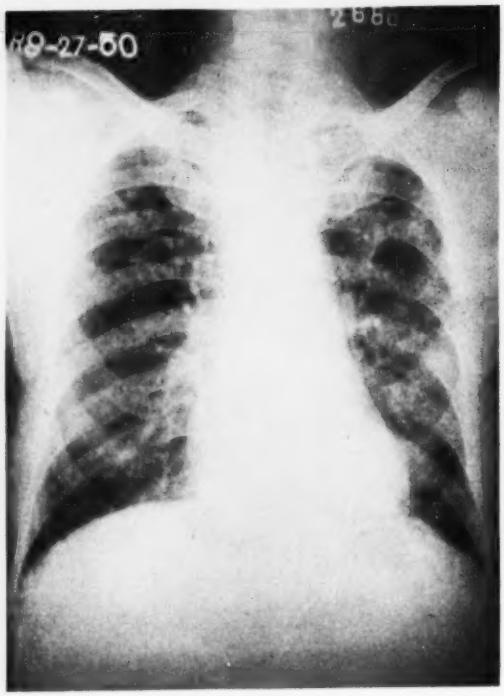

Fig. 5.—Case 7.

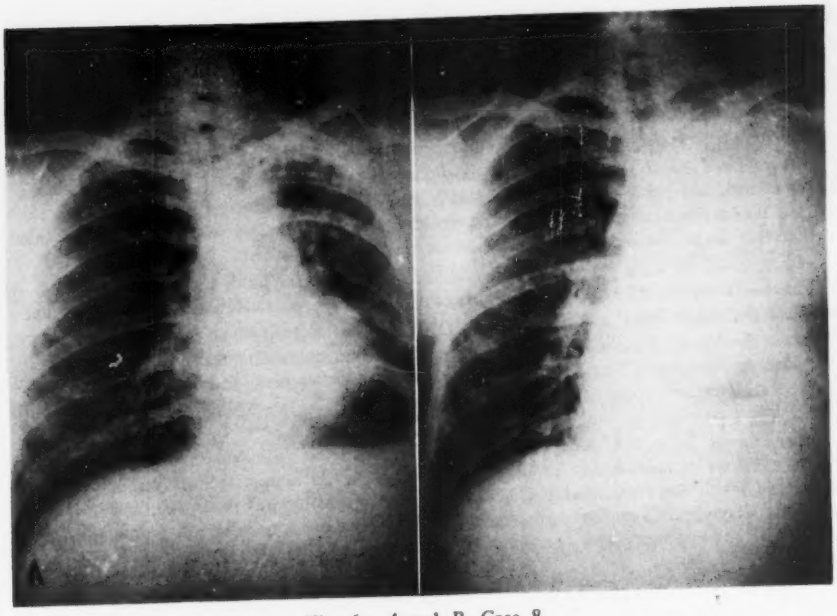

Fig. 6.—*A* and *B*, Case 8.

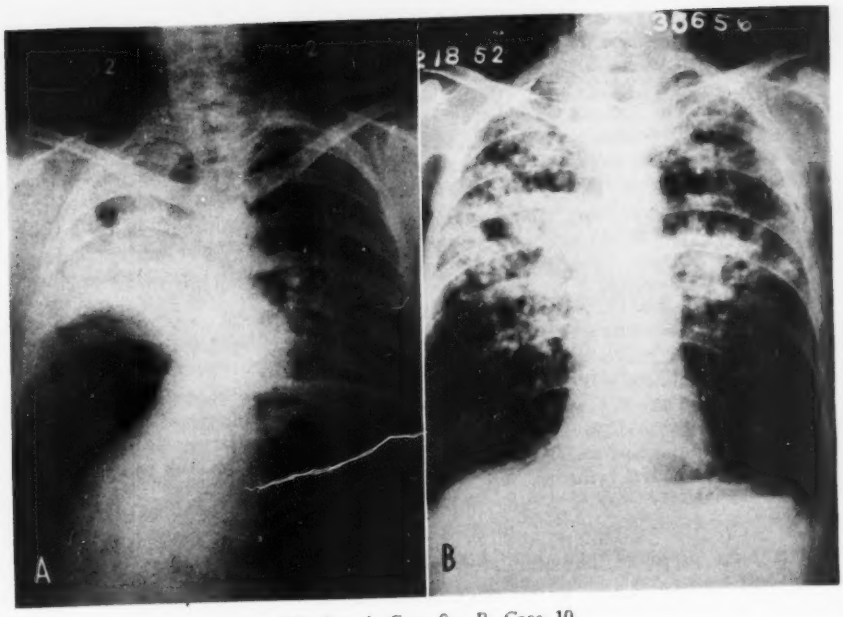

Fig. 7.—*A*, Case 9. *B*, Case 10.

complaints of cough, blood-streaked sputum, and weight loss of two months' duration. A neoplasm was suspected. Bronchoscopy did not reveal any evidence of a tumor. Roentgenograms (Fig. 2*B*), including planigrams, seemed to point to a tumor of the right upper lobe. Exploratory thoracotomy revealed enlarged bronchial and mediastinal nodes. A right pneumonectomy was performed, and the specimen showed a firm consolidated area in the upper lobe which on microscopic examination revealed fibrocaseous tuberculosis.

Vocal Cord Paralysis Due to Pulmonary Tuberculosis.—CASE 3.—H. M., a white man 27 years of age, had paralysis of the left vocal cord. A roentgenogram (Fig. 3*A*) shows a shift of the mediastinum to the left, with extensive disease in the left lung. Autopsy revealed obliterative dense fibrous pleural fibrosis about the left upper lobe.

CASE 4.—R. F. L., a Negro man 59 years of age, had paralysis of the right vocal cord. A roentgenogram (Fig. 3*B*) shows fibrosis, honeycombing, and consolidation in the extreme apex of the right upper lobe.

CASE 5.—W. C. R., a white man 51 years of age, had pulmonary tuberculosis for 10 years previous to admission. There was a sudden onset of hoarseness, and examination revealed paralysis of the left vocal cord. A roentgenogram (Fig. 4*A*) shows multiple cavities in both upper lobes, especially in the left.

CASE 6.—H. E. R., a white man 56 years of age, had active pulmonary tuberculosis for eight years previous to admission. About two months prior to admission tuberculous laryngitis developed which was treated with streptomycin. This apparently was controlled, and hoarseness suddenly developed. Examination revealed paralysis of the left vocal cord. A roentgenogram (Fig. 4*B*) shows considerable fibrosis of both upper lung fields, with possible cavitation in the left apex.

CASE 7.—W. H. H., a white man 62 years of age, had active pulmonary tuberculosis for 10 years previous to admission. There was a sudden onset of hoarseness, and examination showed paralysis of the left vocal cord. A roentgenogram (Fig. 5) reveals extensive fibrosis of both lung fields, with cavitation on the right.

Vocal Cord Paralysis Following Lobectomy.—CASE 8.—J. F. L., a white man 29 years of age, had had bronchiectasis for six years previous to admission, and a left lower lobe lobectomy was performed elsewhere, in 1946. In April, 1951, sputum examination was positive for acid-fast bacilli. On Nov. 5, 1951, a left upper lobe lobectomy was performed, and the apex was found to be bound down very firmly. A partial thoracoplasty was performed. Hoarseness developed after surgery, and examination revealed paralysis of the left vocal cord. A roentgenogram (Fig. 6*A*) taken before surgery shows honeycombing and cavitation in the left upper lobe. The postoperative roentgenogram (Fig. 6*B*) shows the appearance at the onset of hoarseness.

Vocal Cord Paralysis Due to Pulmonary Tuberculosis and Amyloidosis.—CASE 9.—C. S. L., a white man 32 years of age, had had pulmonary tuberculosis since 1947 and had been receiving pneumoperitoneum since 1948. A diagnosis of amyloidosis also had been made, since he showed 80% retention of Congo red in the tissues after one hour. On Feb. 26, 1952, there was a sudden onset of hoarseness, and examination revealed paralysis of the left vocal cord. A roentgenogram (Fig. 7*A*) shows a massive collapse of the right lung and extensive infiltration of the left lung, with old cavitation.

Laryngeal Dysfunction Without Paralysis Due to Pulmonary Tuberculosis.—CASE 10.—W. S. W., a white man 45 years of age, had pulmonary tuberculosis, diagnosed first in November, 1951. In January, 1952, hoarseness developed. Examination of the larynx did not reveal any abnormality. A roentgenogram (Fig. 7*B*) shows extensive infiltration of both upper lobes and areas suggesting bilateral cavitation.

SUMMARY

The nerve supply of the vocal cords has been reviewed, and cases of dysfunction of the cords due to various intrathoracic conditions have been presented.

USE OF STAINLESS-STEEL SUTURES IN RHINOPLASTY

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THE USE of stainless-steel septocolumellar sutures in cosmetic rhinoplasty is effective and practical in the prevention of secondary dropping of the nasal tip. The surgical technique commonly used in rhinoplasty has advanced to such an extent that one may be justified in expecting a highly satisfactory improvement in the appearance of the nose at the end of the operation. If the result as seen in the operating room was permanent, all would be well. Unfortunately, a permanent result does not always follow. Changes frequently take place in the contour of the nose after operation, the distressing change being a dropping of the nasal tip. When this happens, the tip sags and takes on an unpleasing rounded pendulous shape, especially noticeable on profile. Secondary dropping of the tip ruins more results in rhinoplasty than any other feature of the operation.

The rounded feature of the tip after it has "dropped" is due to the high position of the cartilaginous ventral surface of the nasal septum which projects above the new profile line. Sagging of the tip is the end-result of downward traction exerted by the linear contracting scar at the suture line between the columella and the septum and of a downward pull by the orbicularis oris muscle of the lip attached to the columella. The latter force is especially brought into play when the patient indulges in overuse of the muscles of the mouth in the early postoperative period. Patients should always be admonished against excessive postoperative talking, grimacing, laughing, smiling, and gum chewing.

The appearance of the newly constructed nose usually remains good as long as the septocolumellar sutures remain in place. When the commonly used black silk sutures are removed, however, as inevitably they must be at the end of 10 days or two weeks, unwelcome changes too frequently become apparent. To compensate for the tendency of the tip to drop, most surgeons during the operation advance the tip to a more forward position on the septum than they expect or intend it to have ultimately. If one could accurately judge at the time of the operation how much or how little postoperative change might take place in the position of the tip, there would be little or no problem. But one cannot anticipate the exact degree of dropping, since it varies so widely in different persons. In some the change is clearly perceptible; in others very little change occurs. The solution of the problem lies, therefore, in the perfection of some technique that would give reasonable assurance that the nasal tip would remain permanently in the position it has at the end of the operation.

For the past two years, I have routinely used fine stainless-steel sutures to approximate the columella to the septum. I could find no mention of the routine use of steel sutures in cosmetic rhinoplasty in the literature of the past 20 years.

Steel sutures hold the columella firmly in place on the septum, and the tip remains permanently in an elevated position. These sutures never become loose.

The columella is as securely attached to the septum during the healing period as it was at the end of the operation. Since stainless-steel sutures can be left in place without symptoms or appreciable reaction over a comparatively long period, a firm fibrous attachment has time to form in the incision line between the septum and the columella. It is this fibrous union which holds the tip in the desired position and prevents secondary dropping. Scar contractures and external tensions can take place to the fullest extent, and still the tip will not change its position. The counterpull of the unyielding steel sutures prevents the tendency toward distortion. The longest time that stainless-steel sutures have remained in place in one of my patients is 11 months. No infection or discernible reaction was observed in the patient during that period. Many sutures have remained in place for three or four months. Some have never been removed and are undoubtedly buried in the tissues of the nose without any apparent reaction. In the average case, I remove them six weeks after operation. If indicated, one can remove them in two weeks, just as one does when the conventional black silk sutures are used.

When stainless-steel sutures are used, it is not necessary or desirable to raise or overcorrect the position of the tip to any great extent. Mere approxi-

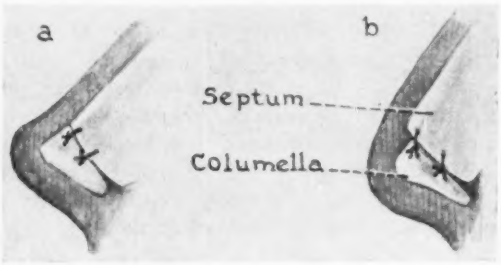

Fig. 1.—(*a*) Black silk septocolumellar sutures at the end of operation. (*b*) Secondary dropping of the tip; notice that the black silk sutures have not retained their original position; the columella is lower on the septum, the tip is rounded, and the nose is slightly longer.

mation of the columella to the septum in their natural positions or, at most, minimal overcorrection will suffice to maintain the desired position of the columella and tip without tension. Marked overcorrection of the tip by raising the columella simulates the action of a rubber band that has been stretched too far; it tends to revert back to the original position it occupied before overcorrection.

A columella placed too high on the septum exerts undue stress and strain on the sutures, holding them in an unnatural position. The columella and the tip in such circumstances have a strong tendency to return to a lower position on the septum. The only situation in which an appreciable overcorrection of the tip is justifiable and advisable is when the columella is too short in the anteroposterior direction and, consequently, more forward projection of the tip is required for aesthetic reasons. In such circumstances one should anticipate the tendency of the tip to drop by lowering the cartilaginous ventral surface of the septum more than one ordinarily would. Suturing the medial crura together, back to back, also increases to a slight degree the forward projection of the nasal tip and minimizes the extent to which one should overcorrect. After the nose has been shortened, any loose edges of mucous membrane remaining at the caudal edge

of the nasal septum should be trimmed flush with the septal cartilage. The presence of this superfluous tissue between septum and columella may be responsible for subsequent sagging of the tip. Close approximation by the use of fine absorbable surgical sutures, U. S. P., of the septal mucous membrane and the columellar skin edges at the septocolumellar incision line minimizes scar contracture and secondary dropping of the tip.

Stainless-steel sutures have long been used and buried in the body tissues by the general surgeon, with little or no discernible reaction. It is true that the regions where they have been most generally used are usually clean and uninfected. The nose is acknowledged to be a potentially infected area, but it is remarkably

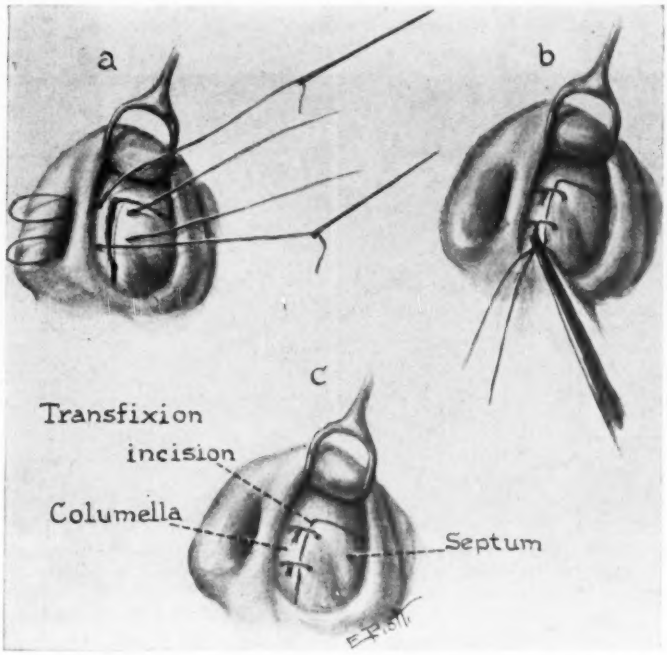

Fig. 2.—(*a*) Stainless-steel septocolumellar approximation sutures; note that the columella is merely approximated to, not elevated on, the septum. (*b*) Stainless-steel sutures tied and twisted in position. (*c*) Firm approximation of the columella to the septum.

resistant to infection. It is known that the nose tolerates foreign bodies well and reacts to a minimal degree to an innocuous foreign substance, such as stainless steel. No infection has been observed following the use of stainless-steel sutures in over 250 consecutive cases. Steel sutures are not surrounded by the reddened angry reaction occasionally observed around black silk septocolumellar sutures which have been left in place for two weeks or longer. Black silk sutures when removed are often loose and ineffectual, whereas steel sutures maintain their original position. Patients are usually not aware of their presence in the nose.

When mention of stainless-steel sutures in the nose is made, invariably the first thought that comes to mind is that they will "cut through" and be ineffectual.

Not in one instance has there been such an occurrence in my series of cases. In fact, if the suture is tied too tightly, it will break before it will cut through. The suture should pass through the septal cartilage and both medial crura cartilages. It ultimately penetrates through the soft tissues overlying the septum and the medial crura and becomes buried within the mucous membrane. The knot, however, is always in evidence. The ends of the suture should be left at least ¼ in. (0.6 cm.) long after the knot has been tied. The cut ends of the suture should be grasped with a small hemostat, twisted together, and bent to a medial position adjoining the septal mucous membrane. The sharp ends of the suture in this position will not prick the alae or produce any annoying symptoms. In an occasional case, the knot was buried in the septocolumellar incision and left there permanently without any deleterious effects or the patient's awareness of its presence.

Fig. 3.—*A*, the convex rounded tip especially suitable for the use of stainless-steel sutures and the invaginating technique; patient shown before operation. *B*, patient shown after operation.

The ends of the suture should be left at least ¼ in. long to facilitate the subsequent removal of the suture. If the ends are cut too short or flush with the septal mucous membrane, the points may irritate and produce discomfort. In two such cases a small granuloma formed after operation. It was easily removed with the suture.

In the removal of a suture, the ends of the knot should be grasped with a fine hemostat, traction applied laterally, and the suture cut medial to the knot with a firm fine-pointed scissors.

I have experimented with different types of steel sutures and have settled upon a braided No. 5-0 stainless-steel atraumatic suture (surgaloy®) made by Davis & Geck, Inc. This material has great tensile strength, handles like thread, is very soft and pliable, and can be tied easily without slipping. The braided feature of the suture is responsible for its uneven and irregular surface and is probably the reason why it does not cut through cartilage, even when firmly tied.

It lacks the polished knife-like smoothness characteristic of the single-strand, unbraided steel suture.

In a recent article [1] I described a procedure which I called the invaginating technique and advocated its use to prevent secondary dropping of the nasal tip. In essence, the technique consists of two steps. First, after the transfixion incision is made, the caudal edge of the septum over its entire anteroposterior length is denuded of its mucous membrane for ⅛ in. (0.3 cm.) on both sides. The second step consists of the eversion of the cut edge of the columella by means of a sharp double hook and the making of a linear vertical incision in the exact midline of the cut edge of the columella to a depth of ⅛ in. By the utilization of Joseph's orthopedic suture, the columella is then sutured to the septum with stainless-steel sutures, thereby invaginating the bare edge of the septal cartilage into the shallow vertical trough made in the columella. Thus, the columellar skin flaps completely encircle and hug the denuded septal cartilage. A through-and-through mattress absorbable surgical suture, U. S. P., passing through the columellar skin flaps and the septal cartilage still further secures these structures in their new position.

This procedure maintains the tip in place with a minimum of postoperative dropping because the invagination permits a wider area of fibrous union between the septal cartilage and the columellar skin flaps than does mere approximation of the columella to the septum without invagination. One should be cautioned, however, that this technique cannot be applied to an already short nose, since invagination has the effect of still further shortening the nose by another ⅛ in. In this situation, steel sutures without invagination should be used. Invagination should likewise not be used when the caudal edge of the septum leans to one side and is therefore not in the exact midline. Its use here would result in a deviation of the columella and nasal tip from the midline, and asymmetry of the tip would result. If the caudal edge of the septum is replaced to the midline by surgical means, invagination may be utilized.

The combined use of stainless-steel sutures and invagination has resulted in a marked reduction of secondary dropping of the nasal tip. When sagging of the tip does occur in an occasional case, it appears only to a minimal degree. The routine use of these two procedures has given me a confidence that was previously lacking when conventional techniques were followed. With their use, the tip tends to retain the aesthetic position obtained at operation better than with the use of any other method with which I am familiar.

CONCLUSIONS

1. Secondary dropping of the nasal tip after rhinoplasty is a result of linear scar contracture at the septocolumellar suture line and the downward pull of the orbicularis oris muscle.

2. Stainless-steel sutures seem to counteract these factors by keeping the component parts of the nasal tip in their proper position until after the above factors have acted to a maximum degree.

1. Fred, G. B.: The Nasal Tip in Rhinoplasty: Use of the Invaginating Technique to Prevent Secondary Dropping, Ann. Otol. Rhin. & Laryng. **59**:215 (March) 1950.

3. The combined use of stainless-steel sutures and the invaginating technique has produced uniformly good results in the prevention or the minimization of secondary dropping of the nasal tip after rhinoplasty.

520 Beacon St.

Dr. Joseph Winsten, former resident in Otolaryngology at the Beth Israel Hospital, Boston, contributed suggestions in the preparation of this paper and looked up the literature on the use of stainless-steel sutures in cosmetic rhinoplasty.

EFFECTIVE VACCINE THERAPY IN CHRONIC BACTERIAL INFECTIONS OF UPPER RESPIRATORY TRACT

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THE IMPORTANT role played by chronic upper respiratory infection in the etiology of many systemic diseases and functional disorders is not sufficiently recognized. Relief or cure of the latter may be impossible until the primary focus of infection is removed. Unfortunately, attention is concentrated on the infected tissue rather than on the infecting organisms. Rhinolaryngologists eradicate infected tissue and drain infected cavities and then imagine that they have removed the focus of infection. As a rule, they make no attempt to destroy the infecting bacteria that remain at and near the infective site or to neutralize their toxic products. They therefore have failed to remove the bacterial focus of infection, which is the real cause of the secondary disturbances. This requires stimulation of specific antibody production to combat the infecting bacteria and their toxins.

INFECTION—ACUTE, CHRONIC, AND LATENT

A brief review of infection may lead to a better understanding of the methods necessary to combat it.

Like other animals, human beings are endowed with a natural protection against the bacteria surrounding them. The first barrier consists of the skin and mucous membranes, which in the healthy and resistant state mechanically prevent the entrance of micro-organisms into the body. The presence of bacteria on these surfaces, therefore, should be looked upon as a contamination rather than as an infection. An added protection in this barrier is afforded by the bactericidal properties of the secretions. When a person's general resistance is lowered by fatigue, chill, and other depressing conditions, and, when the bacteria attacking him are in great numbers and very virulent, the bacteria may penetrate this protective barrier and enter and invade the deeper tissues, where they multiply and secrete a soluble toxin, or poison. Here they encounter the second line of defense, which tends more or less perfectly to inhibit further progress. This defense consists of the bactericidal power of the blood and the phagocytic powers of the leucocytes and other cells. The poisons, or toxins, within the bodies of the bacteria, their endotoxins, stimulate the human body's defensive mechanism to manufacture antibacterial substances that injure and tend to destroy the bacteria, while the soluble toxins secreted by the micro-organism outside its body into the human tissues, its exotoxins, stimulate the production by the human body of antitoxin which neutralizes the exotoxin.

Read before the Philadelphia Laryngological Society, March 4, 1952.

This battle between the bacteria multiplying and secreting poisons and the human body manufacturing antibacterial and antitoxic substances constitutes the acute infection or disease.

Should the bacteria overwhelm the body with their toxic products and win a complete victory, the patient dies. If the body is able to destroy completely the bacteria and neutralize their poisons, the patient recovers. Frequently, however, the fight ends in a draw, or stalemate. The bacteria maintain themselves in the tissues and manufacture some toxins, enough to keep the patient more or less ill but not sufficient to kill him, while the body manufactures sufficient antibodies to keep the bacteria under control and to neutralize the poisons to some extent, but not enough to destroy them completely. This situation results in a chronic infection. Sometimes the body and the bacteria are able so to adjust to one another that the micro-organisms, although present, remain quiescent and give rise to no disturbances or symptoms. This state is regarded as a subclinical, or latent, infection.

A chronic infection of the upper respiratory tract may have several deleterious effects. The tissues at the infective site may remain chronically inflamed, sometimes with pus formation. The infecting bacteria may be carried by the lymph or blood from the infected area to distant tissues and organs where they form metastases, or secondary foci of infection.[1] In nearly every case the soluble exotoxins secreted by the bacteria at the primary focus of infection cause a systemic toxemia, characterized by asthenia and by nervous, functional, allergic, and other manifestations, which frequently simulate organic disease.[2] Few physicians seem to recognize these symptoms as the result of a bacterial toxemia.

FOCAL INFECTION

The conditions and symptoms just described, which have their origin in a small area of chronically infected tissue, the primary focus, comprise the condition spoken of as focal infection. The commonest location of the primary focus is the upper respiratory tract, especially the tonsils, the tonsillar fossae, the nasopharynx, and the accessory nasal sinuses.

The relationship between sinusitis and systemic disease was recognized two thousand years ago by physicians who identified nasal discharges with the cerebral fluid, Aristotle referring to them as "the superfluities of the brain." Celsus [3] wrote, "If the humor flows from the head into the nose, it is mild; if into the throat, it is worse; if actually into the lungs, it is the worst of all." Galen [4] taught that the thick

1. (*a*) Solis-Cohen, M.: Focal Infection, in Cyclopedia of Medicine, Surgery and Specialties, Philadelphia, F. A. Davis Company, 1944, Vol. 6, p. 328; (*b*) The Importance of Focal Infection in Obstetrics, Surg., Gynec. & Obst. **78**:44 (Jan.) 1944; (*c*) The Real Removal of Focal Infection as the Cause of Ocular Disorders, Am. Pract. **2**:576 (May) 1948.

2. (*a*) Solis-Cohen, M.: Nervous, Functional and Asthenic Manifestations of Chronic Focal Infection, Postgrad. Med. **6**:438 (Dec.) 1949; (*b*) Bacterial Toxemia: Symptoms Simulating Systemic Disease; Diagnosis; Treatment, Pennsylvania M. J. **39**:958 (Sept.) 1936; (*c*) Gastrointestinal Disturbances Due to Bacterial Toxemia from Focal Infection, Rev. Gastroenterol. **7**:112 (March-April) 1940.

3. Celsus, quoted by Riverius, L.: Praxis medica, Lugduni, J. A. Huguetan & M. A. Ravaud, 1653.

4. Galen, C.: Opera omnia, in Medicorum graecorum opera quae exstant. Editionem curavit Carolus Gottlob Kühn, Lipsiae, Onobloch, 1821-1833, Vol. 2.

discharges, such as those in acute or chronic catarrh, are carried downward, first passing through the ethmoids and then being evacuated into the channels of the nose. From the middle ages to the 18th century physicians studied the "Regimen sanitatis Salerni," a textbook of the famous School of Salerno, which states,[5] "If the rheum flows to the chest, it is called catarrh; to the throat, it is bronchus; to the nose, it is coryza." Fernelius,[6] in 1644, and Riverius,[7] in 1653, elaborated on the various effects produced in the different tissues and organs by this rheum, or nasal discharge.

Misconception of a Focus of Infection.—Unfortunately, most physicians have a misconception as to the nature of a focus of infection,[8] due probably to Billing's defining it as "a circumscribed area of tissue infected with pathogenic organisms."[9] This mechanical conception has led rhinolaryngologists to believe that they remove the focus of infection when they enucleate infected tonsils or drain an infected sinus. More physicians would realize that this conception is far from the truth if they regarded a focus of infection as bacterial rather than as structural and conceived it as "infecting bacteria, pathogenic for their host and producing toxins harmful to him, which have their habitat in a more or less circumscribed area.[10] Enucleation of an infected tonsil gets rid of that infected tissue with the organisms it contains. But it does not remove the infecting bacteria remaining in the tonsillar fossae, in the nasopharynx, and on the pharyngeal wall, the tonsillar pillars, and other adjacent structures, where they continue to live, multiply, and manufacture toxins. Similarly, drainage of a nasal accessory sinus washes out most of the infecting organisms, but those that remain continue the infection.[11] This situation may be one reason for the outcry against "the massacre of the tonsil" and for Proetz's admission, "We know . . . that from a shocking percentage of sinus operations no relief is obtained; in fact, the operation often aggravates the symptoms and produces new ones."[12] I have repeatedly pointed out the worthlessness of comparing tonsillectomized and nontonsillectomized children, inasmuch as many, if not most, of the tonsillectomized children doubtless still retain their bacterial foci of infection.[13]

Effective Removal of a Chronic Bacterial Focus of Infection.—To rid completely a patient of a bacterial focus of infection, it is essential, in addition to any required operation, to combat the infecting organisms and to neutralize their soluble exotoxins.

In cases of acute infection this removal of the focus may sometimes be accomplished by the administration of the appropriate antibiotic. The latter, however, is less applicable in cases of chronic infection, because in such cases it does not destroy

5. School of Salerno: Regimen sanitatis cum expositione magistri Arnoldi de villanova Cathellano noviter impressus. Hoc opus optatur: quod flos medicine vocatur.

6. Fernelius, J.: Consiliorum medicinalium liber, ex ejus adversariis quadringentarum consultationum selectus. Editio praecedentibus auctior. Lugduni Batavorum, Hackii, 1644.

7. Riverius, L.: Praxis medica, Lugduni, J. A. Huguetan & M. A. Revaud, 1653.

8. Solis-Cohen, M.: Necessity for Revising the Common Conception of Focal Infection. J. A. M. A. **102**:1128 (April 7) 1934.

9. Billings, F.: Focal Infection, New York, D. Appleton & Company, 1916.

10. Solis-Cohen.[1a] Solis-Cohen.[8]

11. Solis-Cohen, M.: Why Otolaryngologists Frequently Fail to Remove a Focus of Infection, Ann. Otol. Rhin. & Laryng. **43**:586 (June) 1934.

12. Proetz, A. W.: The Sinus in Perspective, Ann. Otol. Rhin. & Laryng. **38**:682 (Sept.) 1929.

13. Solis-Cohen.[2a] Solis-Cohen.[8] Solis-Cohen.[11]

all the organisms, its beneficial action does not persist long after its suspension, and it cannot be given indefinitely or for long periods without danger. To rid the body of a chronic infection, the most effective procedure is to imitate nature by the artificial stimulation of the production of the patient's specific protective and combative antibodies. This is accomplished by the proper injection of a properly prepared vaccine consisting of the bodies of the killed infecting bacteria, which contain their endotoxins, together with the broth in which they grew, which contains their soluble exotoxins. It is essential, however, that these bacillary bodies and exotoxins be of the particular strain that is causing the infection, so that they will stimulate the manufacture of the specific antibodies required to combat them and their specific toxins.[14]

The mere presence, however, of a micro-organism on a chronically infected mucous membrane is no indication that it is the etiological factor in the infection. Yet such a relationship is assumed by many bacteriologists who make their vaccines from the organisms that grow up in an ordinary culture medium inoculated from the infected tissue. In 858 cultures in cases of chronic infection made by me in ordinary culture media the etiological organisms failed to grow up in 10.2% of them, owing to their having been overgrown and killed by the bacteria present which were nonpathogenic for their host.[15] Others have reported similar observations.[16]

Some bacteriologists select the organism that predominates in the culture, which in cases of acute infection frequently is the etiological organism. But in instances of chronic infection this is not always the case.[17] In 44% of 384 cultures made by me in cases of chronic infection the predominating organism was not even pathogenic for its host.[17d]

There are bacteriologists who select from a mixed culture the micro-organism that is commonly regarded as pathogenic for humans in general, apparently not realizing that the power of individual strains of bacteria to invade is by no means

14. Solis-Cohen, M.: Vaccine Therapy in Chronic and Focal Infections, Internat. Clin. **2**:214 (June) 1939.

15. Solis-Cohen, M.: Unreliability of Ordinary Cultures in Chronic Infections, Am. J. Clin. Path. **14**:386 (July) 1944.

16. (*a*) Crowe, H. W.: The Specific Vaccine Treatment of Chronic Arthritis and Rheumatism, J. Lab. & Clin. Med. **15**:1072 (Aug.) 1930; (*b*) Pathogen-Selective Culture and Its Bearing on the Classification and Aetiology of Chronic Rheumatic Disease, Charterhouse Rheumatism Clinic, Original Papers, London, Humphrey Milford, **1**:3, 1937. (*c*) Lowe, E. C.: Pathogen-Selective Culturing in Dental Infection, Brit. Dent. J. **49**:457 (May) 1928; (*d*) Pathogen-Selective Cultures as an Aid to the Diagnosis of Infective Foci, Brit. M. J. **2**:98 (July) 1928. (*e*) Shearman, C. H.: The Application of Pathogen-Selective Methods of Culture in the Investigation of Foci of Infection in Arthritis, M. J. Australia **2**:662 (Nov. 9) 1929.

17. (*a*) Solis-Cohen.[15] (*b*) Solis-Cohen, M., and Heist, G. D.: A Method of Distinguishing from Among Various Microorganisms Present in a Patient, Those That Are and Those That Are Not Acted upon by That Patient's Whole Coagulable Blood, Pennsylvania M. J. **25**:27 (Oct.) 1921; (*c*) Accentuating Pathogenic Organisms in Culture by Utilizing the Inhibitory Influence of Whole Blood, Brit. J. Exper. Path. **8**:149 (June) 1927. (*d*) Boerner, F., and Solis-Cohen, M.: A Study of Pathogen-Selective Cultures in Relation to Vaccine Therapy, Am. J. Clin. Path. **3**:125 (March) 1933.

the same and that persons differ in their degree of resistance to the same organism.[18] Of 1,521 organisms found in 858 of my cultures in cases of chronic infection 27% of hemolytic Streptococci were not pathogenic for their host, nor were 18% of Streptococci of the viridans group, 13% of nonhemolytic Streptococci, 18% of Micrococcus pyogenes var. aureus organisms, and 13% of Micrococcus pyogenes var. albus organisms.[15]

Determination of the Pathogenicity of Bacteria for Their Host.—In addition to those mentioned above, a number of other methods, which are regarded by most investigators as of little or no value, have been employed to obtain the specific infecting organisms. These include the utilization only of "smooth" colonies, the use of direct smears, the study of changes in the leucocytes, the employment of electrical dissociation, cataphoretic velocity, and elective localization, the use of skin tests, agglutinin, precipitin, complement fixation, and hemolysin and opsonin index tests, and growth in guinea pig blood, normal human blood, and normal human serum.[14]

The best criterion for the pathogenicity of a micro-organism for its host is its ability to grow in the blood of its host in vitro. Various methods have been devised for testing hemobactericidal power, employing the patient's blood serum, his whole defibrinated, coagulable, and uncoagulable blood, and an agitated mixture of his serum and leucocytes.[19] Of these methods the best and simplest is my pathogen-selective culture method which uses the patient's fresh whole coagulable blood—blood that has not yet clotted but is still able to clot.[19] This method is based upon experiments conducted by George D. Heist, Solomon Solis-Cohen, and me[20] by which we demonstrated that the fresh whole coagulable blood of the pigeon which is naturally resistant or immune to infection by the Pneumococcus is actively bactericidal to that organism in vitro, while the fresh whole coagulable blood of the mouse and rabbit which are naturally susceptible to Pneumococcus infection permits its free growth in vitro. We also demonstrated that the blood serum of the pigeon does not differ from that of a mouse or rabbit in its action on Pneumococci and that the fresh defibrinated blood of both immune and susceptible species is an excellent culture medium for the Pneumococcus.

Matsunami and Kolmer[21] later showed that the Meningococcus is killed by the whole coagulable blood of the immune rabbit but grows well in the blood of the

18. Zinsser, H.: Resistance to Infectious Diseases, Ed. 4, New York, The Macmillan Company, 1931.

19. Solis-Cohen.[14] Solis-Cohen, M.: Determining the Infectivity of Bacteria for Their Host, with Special Reference to the Pathogen-Selective Culture, Lancet **2**:1447 (Dec. 19) 1936.

20. Heist, G. D.; Solis-Cohen, S., and Solis-Cohen, M.: The Bactericidal Action of Whole Blood with a New Technique for Its Determination, J. Immunol. **3**:261 (July) 1918.

21. Matsunami, T., and Kolmer, J. A.: The Influence of Active Normal Serum (Complement) upon Meningococci: II. The Bactericidal and Protective Value of Fresh Normal Serum Alone and in Combination with Antimeningitis Serum for Meningococci, J. Immunol. **3**:177 (May) 1918; The Relation of Meningococcidal Activity of the Blood to Resistance to Virulent Meningococci, ibid. **3**:201 (May) 1918. Matsunami, T.: Studies on the Meningococcidal Activity of Blood, ibid. **5**:51 (Jan.) 1920.

susceptible mouse. Malone, Avari, and Naidu [22] obtained comparable results with Pasteurella pestis.

The observations of my associates and me were confirmed by Robertson and Sia,[23] Smiley,[24] and Bull and Bartual.[25]

The hypothesis advanced by my associates and me was that when bacteria are seeded in fresh whole coagulable blood before it has time to coagulate only those bacteria grow and multiply which are pathogenic for the animal from which the blood is taken. We believed that any mechanism of immunity existing in the blood may be brought to bear upon the bacteria in this method.[20]

Heist and I [17b] then cultured the different organisms present in various chronic and focal infections in the fresh whole coagulable blood of their host in vitro and of one or more human controls, as well as in defibrinated blood, and found that the bloods of different persons differ in the degree of their bactericidal power against the same organism but that defibrinated blood lacks bactericidal power. The bacteria that are able to grow in the fresh whole coagulable blood of their host in vitro we regarded as pathogenic to him and probably of etiological significance and therefore important to be incorporated in a vaccine.

Control experiments proving the reliability of the method were also made by Lowe,[16c,d] Shearman,[16e] and Crowe.[16a,b] The last mentioned, who made 4,181 pathogen-selective cultures in 1,390 cases involving humans and several hundred other cases, using cultures of single germs, in addition to tests in a series of infected and noninfected rabbits, concludes that it is impossible to doubt the importance of the microbes thus isolated and that one can go so far as to say that when the vaccine treatment of any chronic disease of unkown etiology is to be undertaken this test should never be omitted.[16b]

PREPARATION OF PATHOGEN-SELECTIVE CULTURE AND VACCINE [26]

1. Each material to be cultured is to be secured on a sterile swab (from nares, tonsils, tonsillar spaces, nasopharynx, aural canal, roots of teeth just extracted, tooth sockets, gums, rectum, feces, sputum, pus, prostatic secretion, urine, etc.) and rubbed on the bottom of an empty sterile tube (into which one or two drops of broth have been placed to prevent drying).

2. The swab is then inoculated in the tube of hormone broth medium.

3. When all the tubes have been inoculated, 4 to 12 cc. of blood (depending upon the number of tubes employed) is immediately secured from a vein in the patient's elbow with a sterile needle and syringe and with aseptic precautions.

4. About 2 or 3 cc. of this blood, before it has clotted, is immediately placed in each of the inoculated empty sterile tubes, which are then thoroughly shaken.

22. Malone, R. H.; Avari, C. R., and Naidu, B. P. B.: The Bactericidal Power of the Blood of Rats as a Measure of Their Immunity to Plague, Indian J. M. Res. **13**:121 (July) 1925.

23. Robertson, O. H., and Sia, R. H. P.: Studies on Pneumococcus Growth Inhibition: II. A Method for Demonstrating the Growth-Inhibitory and Bactericidal Action of Normal Serum-Leucocyte Mixtures, J. Exper. Med. **39**:219 (Feb.) 1924.

24. Smiley, H. E.: Bactericidal Action of Blood of Rabbits Immunized Against Pneumococci, J. Infect. Dis. **33**:88 (July) 1923.

25. Bull, C. G., and Bartual, L.: Pneumococcus Cultures in Whole Fresh Blood: I. The Retardative Effect of the Blood of Immune Animals and the Mechanism of the Phenomenon, J. Exper. Med. **31**:233 (March) 1920.

26. Kolmer, J. A., and Boerner, F.: Approved Laboratory Technic, New York, D. Appleton & Company, 1931, and subsequent editions.

5. The blood tubes and the hormone broth tubes are incubated for 24 hours and then examined by smear. At this time each tube is plated on blood agar for identification of the organisms. Also, a tube of hormone broth should be inoculated from the blood tubes, and one tube should be inoculated from the original hormone broth tubes.

6. The vaccine is made up by the mixture of one part of the broth subculture from the hormone broth tubes and nine parts of the broth subculture from the blood tubes.

7. The mixed suspension is counted by the counting chamber or by Wright's method.

8. To make 20 cc. of vaccine containing 1,000,000,000 organisms per cubic centimeter, in a sterile vial or bottle containing a few glass beads 3.6 cc. of the broth suspension, 14.4 cc. of sterile saline, and 2 cc. of 5% tricresol are placed.

9. The vial containing the vaccine is sealed by a stopper with a sterile rubber cap, and then the solution is mixed and incubated at 37 C. for 24 hours.

10. In at least 10 cc. of a suitable broth medium 0.2 cc. of the vaccine is cultured for sterility.

ADMINISTRATION OF PATHOGEN-SELECTIVE VACCINE [27]

As a rule, a pathogen-selective vaccine is extremely potent. Individual sensitivity to it varies greatly, sometimes a trillionfold. Consequently, there can be no standard dosage. The appropriate dose required by one patient may be one-millionth or one-billionth of that required by another patient.

In order to approximate the initial therapeutic dose for the individual patient, one should make intracutaneous tests in the patient's forearm of different amounts of the vaccine. The largest amount tested will vary from 50,000,000 to 50,000 organisms, depending upon one's impression of the patient's sensitivity, derived from the history. The next amount tested should be from one-tenth to one-thousandth of the first and the third from one-tenth to one-thousandth of the second. At the same time an intracutaneous test with a broth control should be made.

The reactions should be observed and recorded by the physician and/or the patient every few hours for two days, at the end of which time they should be examined and evaluated by the physician who should study the records of the observations.

The amount that produced the least reaction should be given as the initial therapeutic dose, except in cases of severe asthma when the dose should be one-tenth to one-thousandth of this amount.

Subsequent doses are based upon the general, focal, and local reactions to the immediately preceding dose. Of these the general reaction is the most sensitive and the local reaction the least. As a rule, a local reaction occurs only when the dose is too great.

General and focal reactions may be favorable or unfavorable. A favorable general reaction is recognized by disappearance or diminution of unpleasant general symptoms and by immediate general improvement in strength, vigor, "pep," appetite, etc. Indications of an unfavorable general reaction are increase of unpleasant symptoms, the occurrence of tiredness or exhaustion, somnolence or insomnia, anorexia, nervousness, depression, dreams (especially nightmares), joint or muscle pains, tachycardia, palpitation, frequent urination, etc.

The presence of a favorable focal reaction is shown by cessation or improvement of symptoms at the primary or secondary foci. Exacerbation of symptoms at a focus

27. Solis-Cohen.[14] Solis-Cohen, M.: Specific Vaccine Therapy in Treatment of Sinusitis, Arch. Otolaryng. **35**:623 (April) 1942.

and the occurrence there of new symptoms, such as sneezing, rhinorrhea, sinal tenderness, hoarseness, sore throat, cough, and expectoration, are signs of an unfavorable focal reaction.

Doses producing markedly favorable general and focal reactions should be repeated. When the reactions are only slightly favorable the dose may be increased slightly, by a tenth or fifth. When there is no reaction the dose can be increased 33.33 or 100% or more.

A slightly unfavorable reaction is an indication for a slight diminution or for a repetition of the dose. After a markedly unfavorable reaction, depending on its degree, no injection should be given until the subsidence, or a week following the subsidence, of the reaction, at which time the dose should be one-tenth, one-hundredth, or even one-thousandth of the preceding dose.

When it is necessary to establish a regular interval it is usually safe to make it 5 to 10 days when there is no severe reaction. The best plan, however, is to give the next dose just before the good effect of the previous dose has worn off, if this can be estimated; otherwise, the dose should be given just as it is beginning to wear off and some symptoms are beginning to return. The interval will gradually be lengthened to a month, six months, or a year, after which time no further treatment may be required.

When the vaccine fails to produce beneficial results it would be well to make new cultures to see whether organisms not in the vaccine may be infecting the patient, in which case it will be necessary to prepare a new vaccine.

CLINICAL RESULTS WITH PATHOGEN-SELECTIVE VACCINE

My results with the pathogen-selective vaccine have been generally favorable. In many cases the patient has been completely cured of both his local and his systemic infection. In others the local infection and the accompanying toxemia have been kept under control by vaccine therapy, without being completely cured. In some of these cases it has been necessary to continue the vaccine treatment for years or indefinitely in order to insure comfort. Occasionally the patient is so hypersensitive to the bacterial toxins, or becomes so during the treatment, that even the most infinitesimal dose produces an unfavorable reaction. When this occurs, it may be necessary to discontinue vaccine treatment. In many cases of bacterial allergy, characterized by constant sneezing, asthma, etc., there has been cure by bacterial vaccines. Even patients allergic to pollens, dog hair, and lobster, who also had chronic sinusitis, were completely relieved of that allergy with the administration of a bacterial vaccine, as though the external allergens were sufficiently irritating to produce hypersensitiveness only when the mucous membranes were inflamed by infection. Patients with systemic disease, such as chronic osteoarthritis and arthritis of no particular type, and with functional disorders of the circulatory and nervous systems, of the digestive and genitourinary tracts, and of the eye were cured by removal of the bacterial focus of infection. This was aided in many instances by enucleation of infected tonsils or tonsillar remnants, x-ray treatment of the nasal accessory sinuses, and extraction of infected teeth and tooth roots.

CONCLUSIONS

1. Chronic bacterial infections of the upper respiratory tract cause many systemic diseases and functional disorders.

2. Removal of infected tissue or material alone is not always sufficient to effect a cure of the secondary disease, because after operation the infecting bacteria usually still persist at or near the primary focus and continue to manufacture their toxic products.

3. These infecting bacteria are best combatted and their soluble exotoxins neutralized by the stimulation of antibody production through the injection of the dead bodies and the soluble exotoxins of the infecting bacteria.

4. Inasmuch as persons differ in their resistance to the same organism and bacteria of the same species vary in their virulence, the infecting organism necessarily is one that is pathogenic for its host. Consequently, the bacteria that are likely to be of etiological significance, and hence must be included in any vaccine, are those that are pathogenic for their host.

5. The pathogen-selective culture, which selects the organisms that are pathogenic for their host by growing them in his fresh whole coagulable blood in vitro, is the best and simplest test for hemobactericidal power.

6. The dose of a pathogen-selective vaccine must be regulated according to the degree of sensitivity of the patient, one patient sometimes requiring a million times the appropriate dose for another patient.

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MAMMALIAN CILIATED RESPIRATORY EPITHELIUM

Studies with Particular Reference to Effects of Menthol, Nicotine, and Smoke of Mentholated and Nonmentholated Cigarettes

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THE PRESENT study was undertaken to determine the effects of menthol, nicotine, and the smoke of mentholated and nonmentholated cigarettes on excised mammalian respiratory epithelium from humans, rabbits, and rats.

Previous studies on the effects of menthol on ciliated epithelium and on the respiratory tract have given equivocal findings. Proetz [1] reported that a 1% solution of menthol in liquid petrolatum had no effect on the ciliary activity of excised tissue immersed in it for 84 minutes. Similarly, Haggard and Greenberg [2] could find no toxic or irritant action of menthol in concentrations contained in the smoke of mentholated cigarettes on the respiratory tract of rats. Mendenhall and Shreeve,[3] however, reported that smoke solutions from cigarettes produced a depression in the ciliary rate of sections of calf's trachea and that smoke solutions from mentholated cigarettes caused a greater decrease in rate than did those from nonmentholated cigarettes. Further, Fox [4] found that prolonged daily administration of menthol (5% in liquid petrolatum) produced injury to the nasal mucosa of rabbits.

Recently methods have become available which permit a quantitative assessment of drug action on mammalian ciliated respiratory epithelium; these depend upon changes in the rate of ciliary activity and an estimate of the irritant action of drugs

From The South Shore Analytical and Research Laboratory, Inc.

Drs. DeGraaf Woodman, Raymond C. Creasy, and Paul S. Seager, of New York City, cooperated in this study by supplying the human tissue.

1. Proetz, A. W.: Essays on the Applied Physiology of the Nose, St. Louis, Annals Publishing Company, 1941, p. 256.

2. Haggard, H. W., and Greenberg, L. A.: Concentration of Menthol in the Smoke from Mentholated Cigarettes: Study of Local and Systemic Effects, Arch. Otolaryng. **33**:711 (May) 1941.

3. Mendenhall, W. L., and Shreeve, K.: The Effect of Cigarette Smoke on the Tracheal Cilia, J. Pharmacol. Exper. Therap. **60**:111 (April) 1937; Effect of Tobacco Smoke on Ciliary Action, ibid. **69**:295 (March) 1940.

4. Fox, N.: Effect of Camphor, Eucalyptol and Menthol on the Vascular State of the Mucous Membrane, Arch. Otolaryng. **6**:112 (Aug.) 1927; The Effect of Camphor, Eucalyptol and Menthol on the Nasal Mucosa, ibid. **11**:48 (Jan.) 1930.

on the epithelium. It became of interest, therefore, to study the effects of menthol, nicotine, and smoke solutions on ciliated respiratory epithelium under carefully controlled conditions using these methods.

EXPERIMENTAL PROCEDURE

Ciliated respiratory epithelium from humans, rabbits, and rats was used in this investigation. This tissue consisted of cross-sectional tracheal rings of rabbits and rats and epithelial strips from human nasal mucous membranes and epithelium overlying the turbinates.

The methods used for the preparation of the tissue for experimental study were patterned on those of Scudi, Kimura, and Reinhard [5] and Greenwood, Pittenger, Constant, and Ivy.[6] Ciliary activity of the fresh-moistened tissues was observed microscopically, with magnifications of 160 and 720 diameters. Loss of ciliary movement was taken as the end-point.

The tracheas were rapidly removed from the animals, washed in Locke-Ringer solution, and sectioned. The tracheal rings were kept in Locke-Ringer solution at 25± 5 C. until ready for use. The human tissues removed surgically, with and without local anesthesia, were immediately placed in Locke-Ringer solution and kept at 5 C. until ready for use. Only epithelium which appeared normal and had actively beating cilia was used. The rabbit and rat tracheal rings could always be used, but some of the human tissue had to be discarded since no active cilia could be found. The tracheal rings were observed within 1 hour of the time they were removed from the animals, the human tissue within 24 hours after it was removed surgically.

The tracheal rings or epithelial strips were then suspended in 15 cc. of the solution under investigation for periods usually varying from five minutes through two hours. In one experiment the time of observation was extended to 50 hours. Separate tissues were used for each time period of observation. After exposure to the test solution, the tissues were washed by successive immersions in Locke-Ringer solution for five minutes and two minutes and were then examined microscopically. Control studies indicated that if the cilia had stopped or had been slowed during the period of exposure, washing did not restore activity. The presence of "globoid bodies" or changes in the condition of the epithelium were also noted.

All solutions of the drugs were made up in Locke-Ringer solution. *l*-Menthol, U. S. P., was used in a saturated solution, the concentration of which was approximately 0.04%. Nicotine, C. P., was used in concentrations varying from 1 to 100 mg. per cubic centimeter. Mixtures of menthol and nicotine were also used. Control observations were made in Locke-Ringer solution, and the effect of pH was studied over a range of 5.0 through 9.5. Many of the studies were carried out at both 25 ± 5 C. and at 35 C.

Cigarettes were smoked on the C. D. Wright [7] smoking apparatus. Five of the 7 cm. of the cigarettes were smoked, and the time of smoking was measured with a stop watch. This smoking apparatus duplicates human smoking as closely as it is possible under artificial conditions. Both mentholated and nonmentholated cigarettes were smoked under identical conditions; 20, 15, or 10 cigarettes were smoked successively. The smoke was collected in four absorption bottles in series, each of which contained 25 cc. of Locke-Ringer solution. The smoke solutions from the four absorption bottles were composited, the pH was determined in a Beckman pH meter, model G, and aliquots of the composite were used for the test solution.

RESULTS

1. *Control Studies on Locke-Ringer Solution.*—Rat and rabbit tracheal rings and epithelial strips of human tissue were suspended in Locke-Ringer solution, and

5. Scudi, J. V.; Kimura, E. T., and Reinhard, J. F.: Study of Drug Action on Mammalian Ciliated Epithelium, J. Pharmacol. Exper. Therap. **102**:132 (June) 1951.

6. Greenwood, G.; Pittenger, R. E.; Constant, G. A., and Ivy, A. C.: Effect of Zephiran Chloride, Tyrothricin, Penicillin and Streptomycin on Ciliary Action, Arch. Otolaryng. **43**:623 (June) 1946.

7. Wright, C. D.: Report of Analytical Work on Cigarettes for Federal Trade Commission, F. T. C. Docket No. 4795, Ex. No. 617, Jan. 26, 1944.

time activity studies were performed. These were done at 5, 26 ± 2, and 35 C. Tissues kept at 5 C. were allowed to come to room temperature before observation. Separate tissues were used for each time interval. The results are presented in Table 1.

It is apparent from the data that ciliated respiratory epithelium from the three species remained viable for at least 19.5 hours when kept at 5 C. At 26 ± 2 C. rat and rabbit ciliated respiratory epithelium continued to beat normally for five hours. The human tissue remained active only for 20 to 30 minutes after it was brought to room temperature after storage at 5 C. for 24 hours. It should be emphasized

TABLE 1.—*Viability of Ciliated Respiratory Epithelium in Rabbit's and Rat's Tracheal Rings and Human Tissue Suspended in Locke-Ringer Solution or in 0.04% (Ca.) l-Menthol*

Time, Hours	Locke-Ringer Solution pH 7.0-7.2 Temperature			0.04% (Ca.) l-Menthol pH 7.3 Temperature		
	5 C.	26 ± 2 C.	35 C.	5 C.	26 ± 2 C.	35 C.
Rabbit's Tracheal Rings						
0	5/5 N. C.*	4/4 N. C.	5/5 N. C.	5/5 N. C.	5/5 N. C.	5/5 N. C.
2	5/5 N. C.	4/4 N. C.	5/5 N. C.	5/5 N. C.	5/5 N. C.	5/5 N. C.
3	5/5 N. C.	5/5 N. C.	5/5 N. C.	5/5 N. C.	5/5 N. C.	5/5 N. C.
5	5/5 N. C.	5/5 N. C.	5/5 L	5/5 N. C.	5/5 N. C.	5/5 L
19½	5/5 N. C.	5/5 L	5/5 L	5/5 N. C.	.....	.....
50	5/5 N. C.	.....	.....	(1/5 N. C. (3/5 S* (1/5 L*	.....	.....
Rat's Tracheal Rings						
0	5/5 N. C.	5/5 N. C.	.....	5/5 N. C.	5/5 N. C.	5/5 N. C.
1	5/5 N. C.	5/5 N. C.	.....	5/5 N. C.	5/5 N. C.	5/5 N. C.
2	5/5 N. C.	5/5 N. C.	.....	5/5 N. C.	5/5 N. C.	5/5 N. C.
5	5/5 N. C.	5/5 N. C.	.....	5/5 N. C.	5/5 N. C.	.....
24	5/5 N. C.	.....	.....	.....	.....	.....
Human Tissue						
0	6/6 N. C.	2/2 N. C.	.....	.....	1/1 N. C.	1/1 N. C.
1/12	.....	.....	.....	.....	.....	.....
1/6	.....	2/2 N. C.	.....	.....	1/1 N. C.	1/1 N. C.
⅓	.....	2/2 N. C.	.....	.....	1/1 N. C.	1/1 S
½	.....	1/2 N. C. 1/2 L	.....	.....	.....	1/1 L
⅔	.....	2/2 L	.....	.....	1/1 N. C.	.....
1	6/6 N. C.	.....	.....	.....	.....	.....
24	6/6 N. C.	.....	.....	.....	.....	.....

* Explanation of abbreviations: N. C., no change; S, slow; L, cessation of ciliary movement.

that all specimens of human tissue were taken from patients in which operative procedures were deemed necessary by the otolaryngologists. It is possible that biopsy material from healthy normal tissue would remain active for a longer time. At 35 C. the rabbit ciliated respiratory epithelium remained active for at least three hours, and that of the rat for two hours.

None of the studies of the drug or smoke solutions was continued longer than 2 hours on the animal tissue or 30 minutes on the human tissue; hence the results are not complicated by spontaneously failing tissues.

2. Effect of pH on Viability of Ciliated Respiratory Epithelium.— In the studies to follow, the pH of the test solutions ranged from smoke solutions which were slightly acid (pH 6.4 through 6.9) to nicotine solutions which were strongly alkaline (pH 8.6 through 9.5). It was pertinent, therefore, to determine the effect of pH per se on ciliated respiratory epithelium. The pH of Locke-Ringer solution

(pH 7.0 to 7.2) was adjusted with 0.1 N HCl and 0.1 N and 2.5 N NaOH to give a range of pH varying from 4.9 to 9.5. Rabbit and rat tracheal rings were exposed to these solutions constantly for one hour, and in some instances for two hours at 26± 2 C. and 35 C.

The results are given in Table 2. Variation of pH from 6.0 to 9.5 had no discernible effect on rabbit ciliated respiratory epithelium at 28 and 35 C. for one to two hours. Similarly, rat ciliated respiratory epithelium was unaffected by a pH of 6.0, but the pH of 4.9 caused cessation of ciliary activity within one hour at 35 C.

3. Viability of Ciliated Respiratory Epithelium in a Saturated l-Menthol Solution (Approximately 0.04%).—A saturated solution of *l*-menthol, U. S. P., approximately 0.04% (0.4 mg. per cubic centimeter) was made up in Locke-Ringer solution. This concentration is 500 times the concentration of menthol from mentholated cigarettes acting on the surface of the mouth and pharynx (Haggard and

TABLE 2.—*Effect of pH on Viability of Rabbit's and Rat's Ciliated Respiratory Epithelium Suspended in Adjusted Locke-Ringer Solution*

pH	Effect at 1 Hour Temperature		Effect at 2 Hours Temperature	
	28 C.	35 C.	24 C.	35 C.
	Rabbit's Tracheal Rings			
6.0	5/5 N. C.*	5/5 N. C.	.....	.....
6.5	5/5 N. C.	5/5 N. C.	.....	.....
7.05	5/5 N. C.	5/5 N. C.	.....	.....
7.42	5/5 N. C.	5/5 N. C.	.....	.....
8.17	5/5 N. C.	5/5 N. C.	.....	.....
	24 C.			
9.0	5/5 N. C.	5/5 N. C.	5/5 N. C.	5/5 N. C.
9.5	5/5 N. C.	5/5 N. C.	5/5 N. C.	5/5 N. C.
	Rat's Tracheal Rings			
	27 C.	35 C.		
4.9	4/4 N. C.	4/4 L*	.....	.....
6.0	4/4 N. C.	4/4 N. C.	.....	.....

* Explanation of abbreviations: N. C., no change; L, cessation of ciliary movement.

Greenberg [2]) and even higher than that of the smoke in the deeper respiratory passages.

Studies identical with those reported in Section 1 were done substituting the *l*-menthol solution for Locke-Ringer solution. The findings are presented in Table 1. It is apparent from these results that a saturated solution of *l*-menthol had no toxic effect on the ciliated respiratory epithelium. The results agree remarkably well with those obtained on Locke-Ringer solution. The studies made on human tissue indicated that the cilia continued active as long in the menthol solution as in Locke-Ringer solution. "Globoid body" formation did not occur sooner in the menthol solution than in Locke-Ringer solution and was not marked until after constant exposure of rat's and rabbit's tracheal rings beyond five hours at 26± 2 C. and two to three hours at 35 C. Scudi, Kimura, and Reinhard [5] relate "globoid body" formation to loss of ciliary motility and to changes in the permeability of the cell membrane, both of which may be interpreted as evidence of irritation and toxicity.

4. Effect of Nicotine Solutions on Ciliated Respiratory Epithelium.—Since nicotine is the most active pharmacologic constituent of cigarettes, studies were planned

to determine its effects on ciliated respiratory epithelium. The results indicated that nicotine had a very low toxicity for rabbit and rat ciliated respiratory epithelium.

The concentrations studied varied from 1.0 through 100 mg. per cubic centimeter in Locke-Ringer solution. The tracheal rings were exposed to these solutions for intervals varying from five minutes through two hours. The results obtained on rabbit's ciliated respiratory epithelium are given in Table 3. A few studies on rat's tracheal rings gave similar results but are not included in the table.

At concentrations of 1 through 5 mg. per cubic centimeter of nicotine, no toxic effects occurred until the tissues were constantly exposed to the solutions for one hour. Scudi and co-workers [5] used a five-minute exposure of the rat's tracheal rings to drug solutions in their quantitative studies. When five minutes was used as the time of exposure, nicotine in concentrations of 1 through 20 mg. per cubic centimeter at 29± 1 C. had no toxic effects on rabbit's ciliated respiratory epithelium (concentration of 1 to 10 mg. per cubic centimeter for the rat's); only the concentration of 100 mg. per cubic centimeter was toxic within five minutes for the rabbit, but concentrations 20 and 100 mg. per cubic centimeter were toxic for the rat. At 35 C. all concentrations through 10 mg. per cubic centimeter were nontoxic at five minutes for rabbit's ciliated respiratory epithelium.

When the studies were extended to determine when toxic effects of nicotine occurred, it was noted that there was a rough linear relationship between the concentration of nicotine, duration of exposure, and toxicity. At 28± 2 C. a concentration of 2 mg. per cubic centimeter was nontoxic for 90 to 120 minutes, 4 mg. per cubic centimeter for 40 to 60 minutes, and 10 mg. per cubic centimeter for 20 to 30 minutes. A concentration of 20 mg. per cubic centimeter stopped ciliary activity within 5 to 10 minutes, and 100 mg. per cubic centimeter was lethal within 5 minutes. When studies were made at 35 C., no difference in the results was seen until a concentration of 20 mg. per cubic centimeter was used. At this concentration effects appeared five minutes sooner than in the studies made at 28.5 C.

5. *Effects of Mixtures of Nicotine and Menthol.*—Nicotine in concentrations varying from 2 to 20 mg. per cubic centimeter was dissolved in 0.04% menthol and in concentrations of 5 and 10 mg. per cubic centimeter in 0.02% menthol. Rabbit's tracheal rings were exposed to these solutions at 29± 1 C. and 35 C. for intervals varying from 5 to 120 minutes. The results are presented in Table 3.

Analysis of the data by the χ^2 method, corrected for continuity in small samples, indicates that there was no synergistic action of 0.04% menthol and nicotine when the studies were carried out for one hour at 29± 1 C., except in the case of the 10 mg. per cubic centimeter concentration of nicotine. In this concentration (10 mg. per cubic centimeter) at 20 and 30 minutes there was a significant difference between the results obtained with nicotine and nicotine plus 0.04% menthol. At 40 minutes no significant differences were found. When the studies using a 4.0 mg. per cubic centimeter concentration of nicotine were extended to 90 to 120 minutes, there was a significant difference between the effects of nicotine alone and nicotine and 0.04% menthol. In contrast to these findings, when the concentration was reduced to 0.02%, menthol appeared to reduce the toxicity of nicotine (see concentrations of 5 and 10 mg. per cubic centimeter of nicotine).

When the studies were done at 35 C., no significant differences were found, using the χ^2 test, between the effects of nicotine solutions alone and mixtures of nicotine

TABLE 3.—*Effect of Nicotine and Nicotine and Menthol, 0.02 and 0.04%, on Rabbit's Ciliated Respiratory Epithelium*

Nicotine Concentration, Mg./Cc.	Temp., C.	pH	Effect at 5 Min.	10 Min.	20 Min.	30 Min.	40 Min.	50 Min.	60 Min.	90 Min.	120 Min.
1.0	28	8.74	5/5 N. C.*	.....	.....	.....	.....	.....	5/5 N. C.	.....	.....
1.0	35	8.74	3/3 N. C.	.....	.....	.....	.....	.....	3/3 N. C.	.....	.....
2.0	30	8.74	6/6 N. C.	.....	.....	6/6 N. C.	.....	.....	5/5 N. C.	5/5 N. C.	4/5 N. C. 1/5 L*
2.0 + 0.04% menthol	30	8.74	5/5 N. C.	.....	.....	5/5 N. C.	.....	.....	5/5 N. C.	5/5 N. C.	4/6 N. C. 2/6 L
2.0	35	8.29	2/2 N. C.	.....	2/2 N. C.	4/4 N. C.	.....	.....	2/2 N. C.	.....	.....
2.0 + 0.04% menthol	35	8.18	2/2 N. C.	.....	.....	2/2 N. C.	.....	.....	2/2 L	.....	.....
4.0	29	8.95	5/5 N. C.	.....	.....	5/5 N. C.	.....	.....	8/10 N. C. 2/10 L	14/15 N. C. 1/15 L	4/5 N. C. 1/5 L
4.0 + 0.04% menthol	29	8.99	5/5 N. C.	.....	5/5 N. C.	5/5 N. C.	.....	.....	8/12 N. C. 4/12 L	6/15 N. C. 9/15 L	5/5 L
4.0	35	8.61	2/2 N. C.	.....	2/2 N. C.	4/4 N. C.	4/4 N. C.	.....	4/4 N. C.	.....	.....
4.0 + 0.04% menthol	35	8.55	2/2 N. C.	.....	2/2 N. C.	4/4 N. C.	3/4 N. C.	.....	2/4 N. C.	.....	.....
5.0 + 0.02% menthol	26.5	9.12	5/5 N. C.	.....	5/5 N. C.	.....	1/4 L	.....	2/4 L	.....	.....
10.0	27.5	9.17	.....	2/2 N. C.	15/15 N. C.	5/5 N. C.	5/5 N. C.	3/3 N. C.	.....	.....	.....
10.0 + 0.04% menthol	27.5	9.21	.....	5/5 N. C.	15/22 N. C. 7/22 L	21/28 N. C. 7/28 L	4/28 N. C. 2/28 S 22/28 L	13/13 L	.....	.....	.....
10.0 + 0.02% menthol	26.5	9.02	5/5 N. C.	.....	5/5 N. C.	3/29 N. C. 26/29 L	10/10 L	.....	.....	.....	.....
10.0	35	9.12	2/2 N. C.	3/3 N. C.	4/5 N. C. 1/5 L	5/5 N. C.	10/10 N. C.	6/6 N. C.	.....	.....	.....
10.0 + 0.04% menthol	35	9.29	2/2 N. C.	.....	1/2 N. C. 1/2 L	.....	4/4 L	.....	.....	.....	.....
20.0	28.5	9.35	9/9 N. C.	10/10 L	.....	.....	.....	.....	.....	.....	.....
20.0 + 0.04% menthol	28.5	9.36	4/4 N. C.	3/3 L	.....	.....	.....	.....	.....	.....	.....
20.0	35	9.35	4/4 L	.....	.....	.....	.....	.....	.....	.....	.....
100.0	28	9.5	3/3 L	.....	.....	.....	.....	.....	.....	.....	.....

* Explanation of abbreviations: N. C., no change; L, cessation of ciliary movement.

TABLE 4.—*Effect of Cigarette Smoke Solutions on Rabbit's Ciliated Respiratory Epithelium*

No.	Cigarettes Smoked, Type	Smoking Time, Min. and Sec.	pH	Temp., C.	Effects at 5 Min	10 Min.	15 Min.	20 Min.	25 Min.	30 Min.	35 Min.	40 Min.	50 Min.	60 Min.	70 Min.
20	Menthol.....	5:33.2	6.83	28	10/10 N. C.*	10/10 N. C.	8/9 N. C. 1/9 S*	2/9 N. C. 5/9 S 2/9 L*	2/10 N. C. 2/10 S 6/10 L	9/9 L	.....	.....	.....	.....	.....
		6:06.2	6.83	35	5/5 N. C.	5/5 N. C.	3/5 N. C. 2/5 S	3/5 N. C. 2/5 S	5/5 L	.....	.....	.....	.....	.....	.....
20	Nonmenthol.....	5:57.4	6.70	29	10/10 N. C.	10/10 N. C.	4/5 N. C. 1/5 S	6/18 N. C. 10/18 S 2/18 L	5/5 L	11/11 L	.....	.....	.....	.....	.....
		7:09.4	6.69	35	5/5 N. C.	.....	3/5 N. C. 1/5 S 1/5 L	2/5 N. C. 1/5 S 2/5 L	5/5 L	.....	.....	.....	.....	.....	.....
15	Menthol.....	6:30.7	6.74	28.5	15/15 N. C.	7/9 N. C. 2/9 S	2/7 N. C. 5/7 S	7/14 N. C. 7/14 S	2/9 N. C. 1/9 S 6/9 L	4/10 N. C. 4/10 S 2/10 L	2/2 L	5/5 L	.....	.....	.....
		6:55.7	6.76	35	5/5 N. C.	5/5 N. C.	.....	1/6 N. C. 2/6 S 3/6 L	.....	2/5 S 3/5 L	.....	6/6 L	.....	.....	.....
15	Nonmenthol.....	6:36.6	6.75	28	12/12 N. C.	7/7 N. C.	4/5 N. C. 1/5 S	8/15 N. C. 2/15 S 5/15 L	4/7 N. C. 3/7 L	6/10 N. C. 2/10 S 2/10 L	2/4 N. C. 2/4 L	2/5 N. C. 3/5 L	5/5 L	.....	.....
		7:58.1	6.73	35	5/5 N. C.	5/5 N. C.	.....	2/5 S 3/5 L	.....	1/5 S 4/5 L	.....	5/5 L	.....	.....	.....
10	Menthol.....	6:45.7	6.84	27	10/10 N. C.	10/10 N. C.	4/4 N. C.	7/9 N. C. 2/9 S	.....	10/13 N. C. 3/13 S	.....	2/7 N. C. 5/7 S	10/18 N. C. 2/18 S 6/18 L	2/12 N. C. 2/12 S 8/12 L	3/3 L
10	Nonmenthol.....	7:15.4	6.74	26.5	14/14 N. C.	14/14 N. C.	.....	13/13 N. C.	.....	10/17 N. C. 4/17 S 3/17 L	.....	5/15 N. C. 7/15 S 3/15 L	1/17 N. C. 4/17 S 12/17 L	2/9 S 7/9 L	.....

* Explanation of abbreviations: N. C., no change; S, slow; L, cessation of ciliary movement.

and 0.04% menthol, again indicating no synergistic action of menthol with nicotine. Further, when the data obtained at 28± 2 C. were compared, using the χ^2 test, with the data obtained at 35 C., no significant differences were found between them.

These results can only lead to the conclusion that menthol in the concentrations contained in cigarette smoke does not alter the effects of nicotine on the respiratory tract.

TABLE 5.—*Effect of Cigarette Smoke Solutions on Human Ciliated Respiratory Epithelium*

No.	Cigarettes Smoked, Type	Smoking Time, Min. and Sec.	pH	Temp., C.	Effect at 5 Min.	10 Min.	15 Min.	20 Min.	30 Min.
20	Menthol.....	6:21.5	6.68	24	2/2 N. C.*	2/2 N. C.	1/2 S* 1/2 L*	1/2 S 1/2 L	2/2 L
		6:25.4	6.70	35	2/2 N. C.	2/2 L	.....	.....	.....
20	Nonmenthol.....	6:23.1	6.6	24	2/2 N. C.	2/2 N. C.	2/2 L	2/2 L	.....
		6:02.9	6.62	35	2/2 N. C.	2/2 L	.....	.....	.....
15	Menthol.....	6:52.5	6.8	26	2/2 N. C.	4/4 N. C.	2/2 N. C.	3/4 S 1/4 L	2/2 L
		7:07.2	6.82	35	2/2 N. C.	2/2 N. C.	.....	2/2 L	.....
15	Nonmenthol.....	6:48.8	6.6	25	2/2 N. C.	2/2 N. C.	2/2 N. C.	1/2 S 1/2 L	2/2 L
		6:41.4	6.62	35	2/2 N. C.	2/2 N. C.	.....	2/2 L	.....
10	Menthol.....	6:26.6	6.6	26	2/2 N. C.	2/2 N. C.	2/2 N. C.	2/4 N. C. 1/4 S 1/4 L	1/1 S
		6:29.6	6.6	35	1/1 N. C.	.....	.....	1/1 N. C.	1/1 N. C.
10	Nonmenthol.....	6:14.4	6.4	25	2/2 N. C.	2/2 N. C.	2/2 N. C.	1/3 N. C. 1/3 S 1/3 L	.....

* Explanation of abbreviations: N. C., no change; S, slow; L, cessation of ciliary movement.

TABLE 6.—*Effect of Cigarette Smoke Solutions on Rat's Ciliated Respiratory Epithelium*

No.	Cigarettes Smoked, Type	Time, Min. and Sec.	pH	Temp., C.	Effect at 5 Min.	10 Min.	15 Min.	20 Min.	30 Min.
20	Menthol.....	6:11.6	6.85	27	2/2 N. C.*	2/5 N. C. 1/5 S* 2/5 L*	2/8 S 6/8 L	.....	.....
20	Nonmenthol.....	6:20	6.75	26	2/2 N. C.	2/5 N. C. 1/5 S 2/5 L	..... 5/5 L	.....	.....
15	Menthol.....	6:27.7	6.53	29	9/9 N. C.	9/9 N. C.	6/13 N. C. 1/13 S 6/13 L	2/9 N. C. 1/9 S 6/9 L	.....
15	Nonmenthol.....	5:53.1	6.46	28	8/8 N. C.	5/5 N. C.	4/8 N. C. 2/8 S 2/8 L	1/8 N. C. 1/8 S 6/8 L	.....
10	Menthol.....	7:05.8	6.70	25	4/4 N. C.	4/4 N. C.	4/5 N. C. 1/5 S	2/5 N. C. 3/5 L	1/5 S 4/5 L
10	Nonmenthol.....	6:53.1	6.59	27	4/4 N. C.	4/4 N. C.	4/4 N. C.	4/5 N. C. 1/5 S	5/5 L

* Explanation of abbreviations: N. C., no change; S, slow; L, cessation of ciliary movement.

6. *Comparative Effects of Smoke Solutions from Mentholated and Nonmentholated Cigarettes.*—The mentholated and nonmentholated cigarettes [8] used in this study were identical except that menthol was present in one type and not in the other. They were smoked under identical conditions on the C. D. Wright [7] smoking apparatus. The results are a composite of a series of studies made over a period of six months on three separate lots of mentholated and nonmentholated cigarettes.

8. The cigarettes were supplied by the Brown & Williamson Tobacco Corporation, of Lexington, Ky.

Ciliated respiratory epithelium from humans, rabbits, and rats was used in this phase of the investigation. The over-all results on the three species of animals were identical, though the time relationships of the effects noted varied with the species studied. In each of the three species of animals studied smoke solutions from mentholated and nonmentholated cigarettes gave identical results. This fact would indicate that the addition of menthol to cigarette tobacco does not change its effects on ciliated respiratory epithelium.

The results are presented in Tables 4, 5, and 6. After five minutes' exposure of the tissues to the smoke solutions no signs of toxicity or irritation ("globoid body" formation) were seen. However, when the time of exposure was extended to determine when changes occur, quantitative differences were found between smoke solutions from 20, 15, and 10 cigarettes, as would be anticipated.

When smoke solutions from 20 cigarettes, both mentholated and nonmentholated, were used at 27 ± 3 C., changes in ciliary activity, slowing and cessation of movement, first were noted in rat tissue at 10 minutes, in human tissue at 15 minutes, and in rabbit tissue at 15 to 20 minutes. When smoke solutions from 15 cigarettes were used, the time intervals were 15 minutes for the rat, 20 minutes for the human, and 15 to 25 minutes for the rabbit; with smoke solutions from 10 cigarettes, the time intervals were 20 minutes for the rat, 20 minutes for the human, and 20 to 30 minutes for the rabbit. The time for complete cessation of activity for 75 to 100% of the tissues used varied from 15 minutes (20-cigarette solution for rat and human) to 60 to 70 minutes (10-cigarette solution for rabbit).

In comparing our data with that of Scudi and co-workers [6] it is noted that smoke solutions from 20 mentholated and nonmentholated cigarettes are less toxic than some of the common antihistamine drugs, such as tripelennamine, methapyrilene, and thonzylamine, and hypertonic solutions of sodium chloride.

When the studies were made at 35 C., again no differences were noted between mentholated and nonmentholated cigarettes, but particularly with smoke solutions from 20 and 15 cigarettes cessation of activity occurred some five minutes sooner than when the studies were done at 27 ± 3 C.

COMMENT

The findings reported in this paper indicate that menthol solutions, within the concentration range studied, had no toxic effects on ciliated respiratory epithelium. Furthermore, menthol does not increase the effects of nicotine, in concentrations up through 5 mg. per cubic centimeter for 1 hour and 20 mg. per cubic centimeter for 10 minutes, or cigarette smoke on ciliated respiratory epithelium. It is difficult to reconcile our findings with those of Mendenhall and Shreeve,[3] who reported that smoke from mentholated cigarettes produced a greater inhibition of calf's ciliated respiratory epithelium than smoke from nonmentholated cigarettes. No mention is made in their paper of the length of time in which their studies were carried out or how the cigarettes were standardized and smoked to obtain the smoke solutions they used. It is also possible that calf's ciliated respiratory epithelium reacts differently from that of the human, rabbit, and rat to menthol. In any case, the present report failed to show any difference between smoke solutions from mentholated and from nonmentholated cigarettes on the ciliated respiratory epithelium of the human, rabbit, and rat.

CONCLUSIONS

1. *l*-Menthol, saturated (0.04%) in Locke-Ringer solution, has no toxic effects on excised ciliated respiratory epithelium for humans, rats, and rabbits.

2. Nicotine has a very low toxicity for ciliated respiratory epithelium of the rabbit and rat.

3. *l*-Menthol, 0.04%, is not synergistic with nicotine in concentrations of 1 to 5 mg. per cubic centimeter for 1 hour; with 10 mg. per cubic centimeter of nicotine for 40 minutes, and 20 mg. per cubic centimeter for 10 minutes. In a concentration of 0.02% menthol is not synergistic with nicotine in concentrations of 5 and 10 mg. per cubic centimeter.

4. Locke-Ringer solution adjusted to pH of 6.0 to 9.5 is nontoxic to the ciliated respiratory epithelium of the rabbit and rat.

5. There is no difference between the effects of smoke solutions from mentholated and nonmentholated cigarettes on the ciliated respiratory epithelium of the human, rabbit, and rat.

PERMANENT RETROGRADE PROGRESSIVE DILATATION

New Treatment for Chronic Laryngeal Stenosis in Children

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THE TERM "chronic laryngeal stenosis" refers principally to the cicatricial stenosis of the larynx. The obstructions due to other causes are classified under other terms, such as acute laryngeal stenosis or the ones included in the group headed congenital stenosis of the larynx.[1]

High tracheotomy, seldom indicated and mentioned here only to be condemned, accounts for 85% of all cases of chronic laryngeal stenosis. The disease is frequently due to bilateral paralysis of both recurrent laryngeal nerves which primarily is not the result of an acute inflammatory condition of the larynx but which is secondarily transformed into a cicatricial stenosis by the performance of a high tracheotomy and the permanence of a tracheal cannula in the subglottic region. Another condition that may cause stenosis is the lack of care of a tracheotomized patient or one undergoing the process of decannulation. Trauma in any of its forms, long tracheal intubation, or the long sojourn of foreign bodies in the larynx are other potential causes of this condition.

Oral sepsis in teeth, diseased tonsils, and sinusitis all contribute to maintain focal infections that can later cause laryngeal stenosis. Inflammatory conditions localized in the larynx, perichondritis, and necrosis of the cartilages not only result in stenosis of the larynx, but they cause a loss of the elastic resistance of the laryngeal cartilages, with diminution of the laryngeal lumen, which gradually may develop into laryngeal stenosis.

From the Hospital Municipal de Infancia de la Habana.

Read at the Third Pan-American Congress of Oto-Rhino-Laryngology and Broncho-Esophagology, Habana, Jan. 20-24, 1952.

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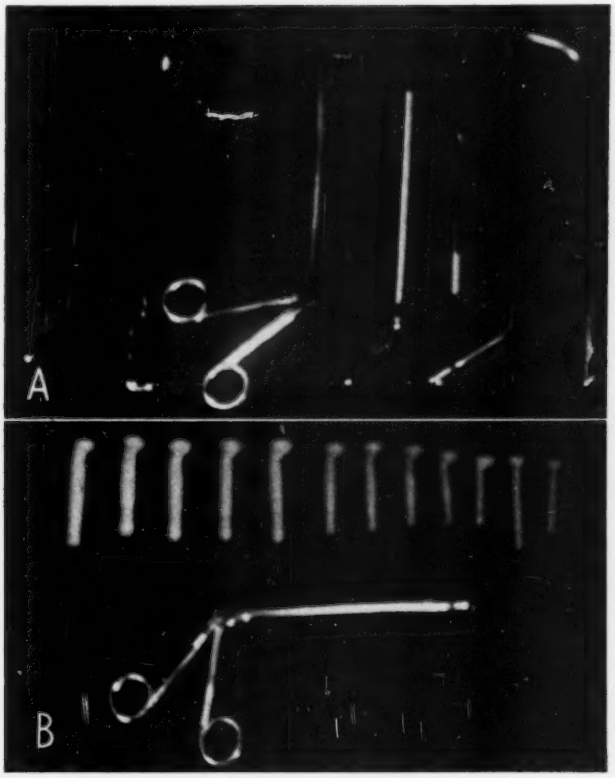

Fig. 1.—*A*, instruments used to start the communication through the stenosis and to insert the dental floss. *B*, rubber core molds used in the treatment of chronic laryngeal stenosis; their use has been discontinued.

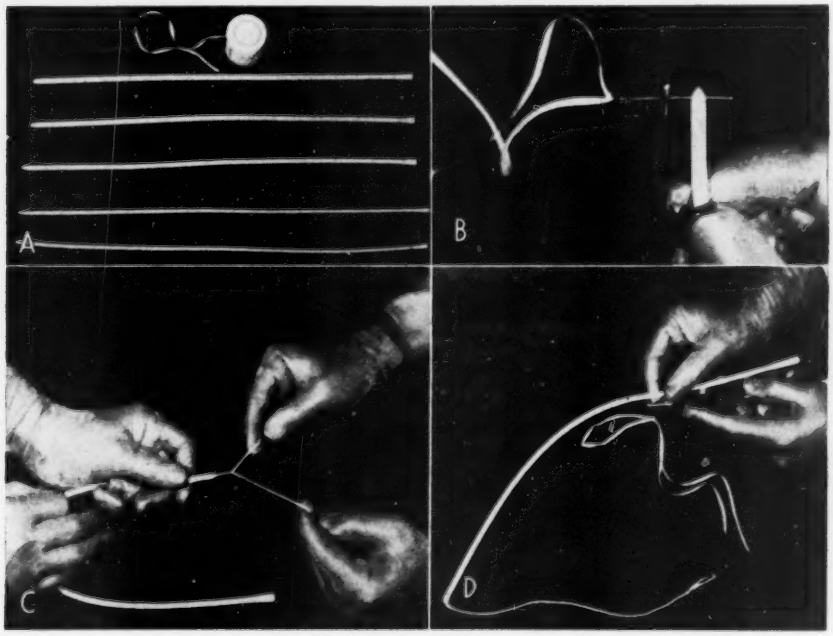

Fig. 2.—*A*, regular rubber Nélaton bougies from No. 8 to 16 and the regular dental floss and needle used in the preparation of the catheters. *B*, *C*, and *D*, different steps showing how to thread rubber bougies with dental floss.

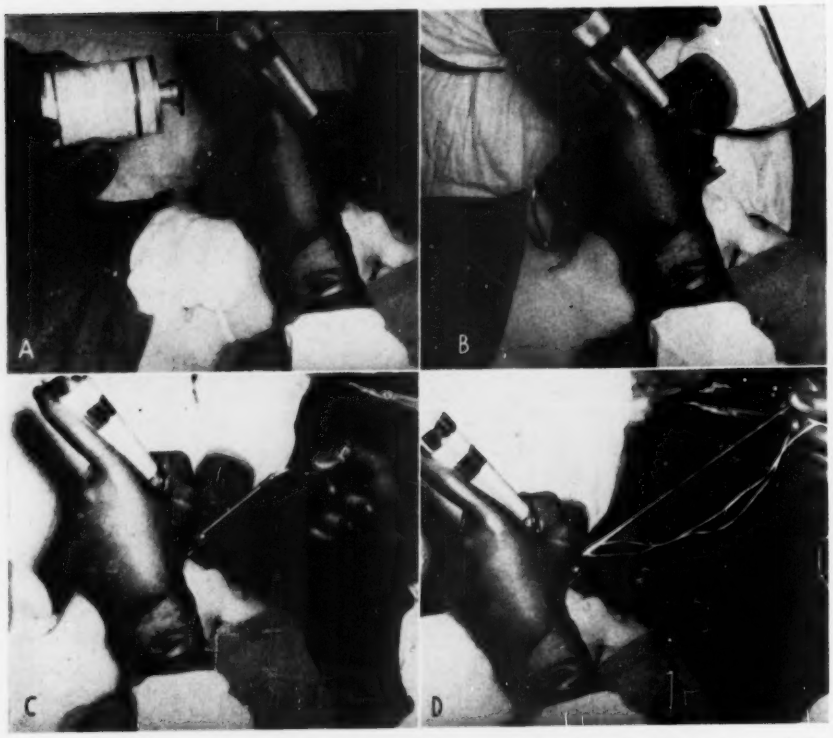

Fig. 3.—*A* to *D*, different steps in the establishment of the first communication and the passage of a dental floss to maintain permeability of the larynx.

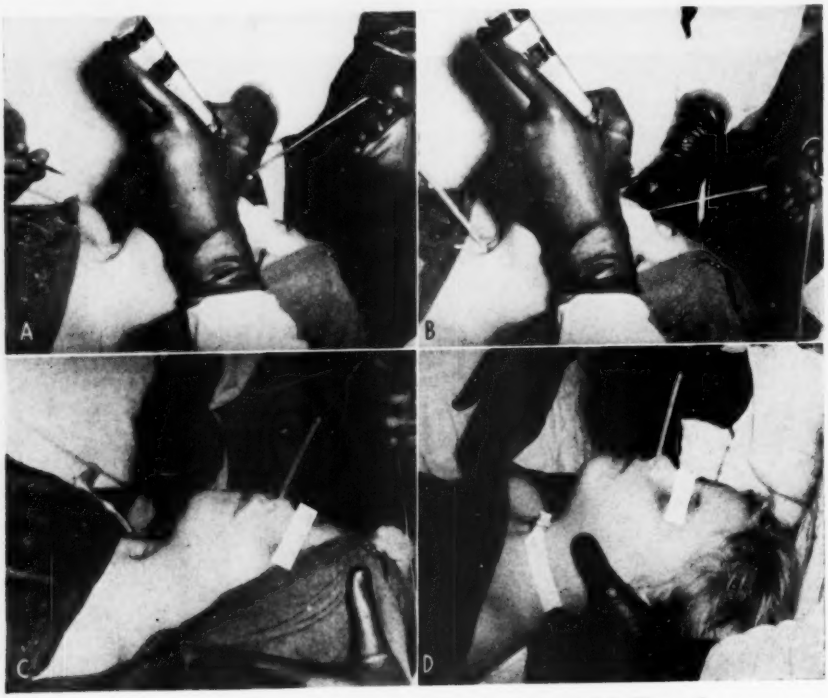

Fig. 4.—*A* to *D*, successive steps of procedure described in Figure 3.

SYMPTOMS

The main symptom of chronic laryngeal stenosis is respiratory difficulty, or dyspnea, which sometimes is associated with dysphonia or complete aphonia. The degree of dysphonia depends on two conditions: the size of the stenosis and its

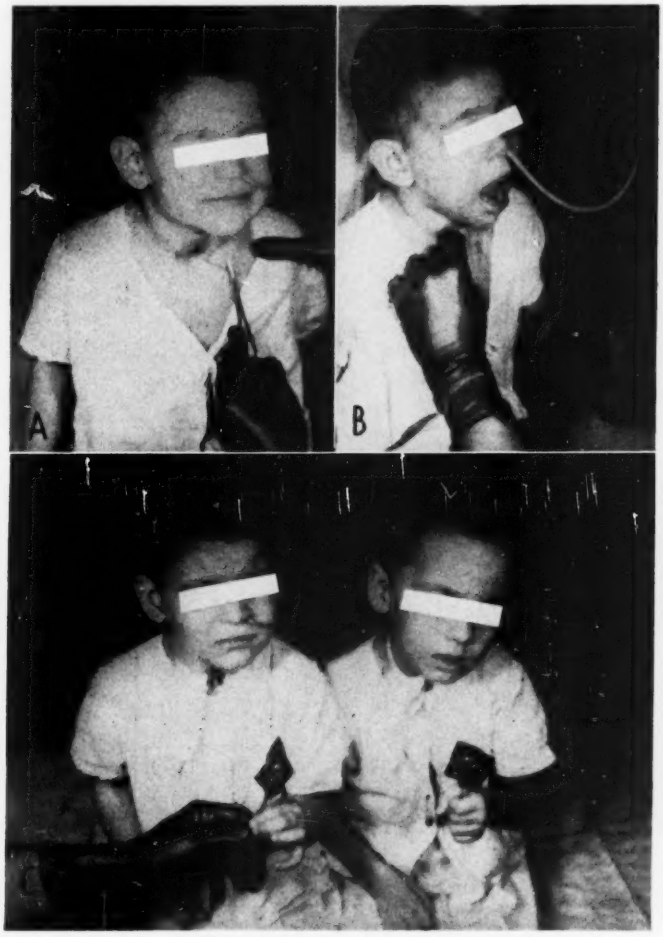

Fig. 5.—*A* and *B*, different steps in the dilatation of the stenosis with Nélaton bougies. *C*, picture showing two patients; the one on the left is already undergoing treatment; treatment of the other has not yet been started; both are shown being presented with lollipops.

duration. It is hard to believe how, sometimes, through a small opening the patient maintains his respiration within normal limits, having adapted himself to the lack of air, but in the great majority of cases the patient wears a tracheal cannula sometimes for months or even years in order to be able to breathe normally.

DIAGNOSIS

The diagnosis is easily made through direct or indirect laryngoscopy. The larynx examination will show the localization and the size of the stenosis. Sometimes complete atresia is present. X-ray examination of the larynx is of considerable importance because, besides showing the presence of communication or patency of the larynx, it will reveal the condition of the laryngeal cartilages. If there is no

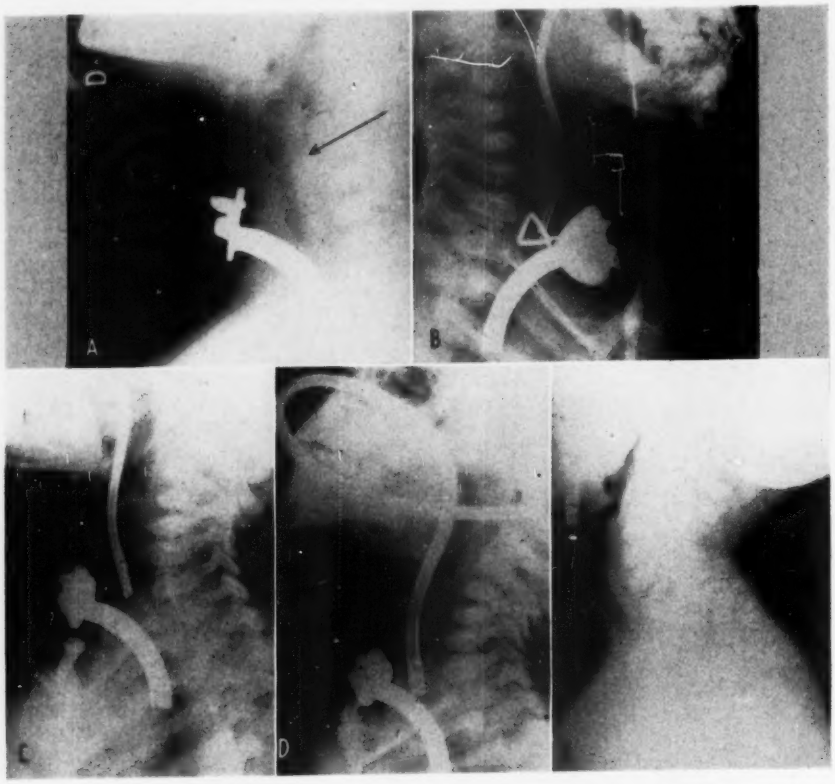

Fig. 6.—*A*, roentgenogram showing the complete stenosis (atresia) of the larynx (marked by arrow). *B*, *C*, and *D*, roentgenograms showing the different sizes of Nélaton bougies, No. 8, 12, and 18, going through the larynx. *E*, roentgenogram showing the patient after complete dilatation without a tracheal cannula.

communication at all, laryngeal atresia is present; the air does not pass through the larynx, and therefore the patient is unable to talk, unless, with time, he has developed an esophageal voice.

TREATMENT

The first thing to be taken into consideration for the treatment is whether adults or children are being dealt with, as there is a great difference between the two groups. The laryngeal cartilages in the adult have ceased to grow, and the cicatriza-

tion is poor. In children the cartilages are still growing, and, if they are properly molded, a good laryngeal patency and a good voice will be obtained. This situation is why the dilatation method is employed in preference to the surgical procedures in children. This paper refers only to the treatment of chronic laryngeal stenosis in children, as my colleagues and I have recently had the opportunity to treat three

Fig. 7.—*A* and *B*, first case; patient shown before and after treatment. *C* and *D*, case of atresia; lateral view of patient before treatment and front view after treatment.

children with chronic laryngeal stenosis, in one of whom the stenosis developed into complete atresia. The etiology in the three cases was as follows: prolonged intubation; high tracheotomy, and long sojourn of the tracheal cannula, as the patient failed to return to the specialist to be decannulated.

My associates and I have named this new method for the treatment of chronic laryngeal stenosis "permanent retrograde progressive dilatation of the larynx." This

method has shortened considerably the time needed in the treatment of this condition, meaning sometimes the difference between success and failure. Patience and time are the two most important factors that have been stressed up to this time in the care of this type of patient, as it is known that many times the patient, and sometimes the physician, is unable to continue a treatment for such a long period.

In one of our most difficult cases, that of laryngeal atresia, my colleagues and I obtained complete recovery after four months of treatment, although on several occasions treatment had to be interrupted, owing to the development of chicken pox, measles, and mumps in the patient.

Up to this time the only procedure of dilatation recommended for children is the use of rubber core molds which are introduced into the larynx with the proper instrument, through direct laryngoscopy. These core molds are progressively changed for larger-sized ones every two or three weeks until the desired dilatation is obtained. We started to use these core molds in our service but found some difficulty in their manipulation, and we finally decided to try our new procedure, permanent retrograde progressive dilatation, which simply employs the regular rubber Nélaton bougies from No. 6 to 20 (French). The first step is to put a thread through the stenosis, using direct laryngoscopy, and to bring it out through the tracheal stoma. In case of complete atresia the permeability necessary to pass the thread (dental floss) is created with the laryngeal needle or knife. Once the thread is in place, the use of the Nélaton bougies is started. (This part of the treatment is explained from beginning to end by the photographic series shown.)

The Nélaton bougie, previously lubricated with K-Y* jelly (water-soluble compound of tragacanth, glycerin, water, and boric acid), is inserted in the tracheal stoma, its end attached to the leading thread, and is then pulled up through the larynx and pharynx and out through one nasal fossa. One end is anchored to the tracheal cannula, and the end that goes through the nostril is left loose. Every week the bougie is changed for the next larger-sized one, using the one already inserted as a guide and traction for the new one to be left in place, and in this way the operator successively proceeds each week until the desired dilatation is obtained, which is checked by direct laryngoscopy and x-ray examination. The bougie that obtains the desired lumen of the larynx is changed at three consecutive times (three weeks) for one of the same number, as a security measure, and finally is entirely removed, and the decannulation of the patient is started by the regular procedures. The tracheal stoma is then closed by reconstructive surgery. This procedure is very similar to the one employed in the treatment of esophageal strictures with the use of the retrograde Tucker bougies. The difference in this new method is that the Nélaton bougie is "permanently" left in place in the larynx until it is substituted by a larger bougie. It is amazing how the patients tolerate the bougie that goes through the trachea, larynx, pharynx, and nasal cavities, having no difficulty whatsoever in swallowing solid and liquid foods; there is only a slight increase in the normal amount of mucus in the nostril in which the catheter is inserted, and it is controlled by the instillation of sodium chloride bicarbonate solution.

SUMMARY AND CONCLUSIONS

I have presented a new method for the treatment of chronic laryngeal stenosis in children with the use of the regular rubber Nélaton catheter, which is an article easily obtained in any hospital. With this simple procedure my colleagues and I have obtained a complete recovery in three of the four cases already mentioned; in the fourth case the patient is still undergoing treatment. We think that we have been able to obtain a great reduction in the time needed for the treatment of chronic laryngeal stenosis and have saved both money and hospitalization days to patients suffering from this condition.

Soledad 205

SYMPTOMATIC LARYNGOCELE IN CANCER OF THE LARYNX

PIERO MEDA
MILAN, ITALY

THE LARYNGOCELE consists of a dilatation of the appendix of the laryngeal ventricle of Morgagni, which at times is already predisposed because its amplitude is greater than the average. It rises from the anterior portion of the ventricle itself. The laryngocele can bulge into the larynx as a smooth, round-shaped mass, thereby forming an internal laryngocele, or it may extend outward into the cervical region through points of minor resistance, especially through the thyrohyoid membrane, thus forming an external laryngocele. This form is usually mixed, as it is associated with the internal form.

The characteristics of the extrinsic laryngocele are determined by its air contents. These characteristics are reducibility under pressure and modification of volume during acts of respiration (Keim and Livingstone [1]; Richards [1a]).

The association of laryngocele with cancer of the larynx has been described by some authors (Bonandini,[1b] Caliceti,[2] Torchiana,[3] Zöllner,[4] Schall,[5] Casadesús and Capellá,[6] and Marschik [7]) in a few cases, from a more or less exclusively anatomical point of view, as in almost all instances study was made on surgically extirpated larynxes.

During recent years systematic use of radiological examination in cancer of the larynx has resulted in the observation of a larger number of cases which in most instances would otherwise have remained unknown.

From the Otorhinolaryngological Clinic of the University of Milan (Prof. L. Pietrantoni, Director).

1. Keim, W. F., and Livingstone, R. G.: Internal Laryngocele, Ann. Otol. Rhin. & Laryng. **60**:39, 1951.

1a. Richards, L. G.: Laryngocele, Ann. Otol. Rhin. & Laryng. **60**:510, 1951.

1b. Bonandini, B.: Laringocele e cancro: Osservazioni istopatologiche e cliniche, Valsalva **22**:7-8; 1-12, 1946.

2. Caliceti, P.: Il carcinoma della laringe, Atti XXXIX Congresso Soc. It. di Laringol., Cagliari, 1951, Pt. 1.

3. Torchiana, L.: Laringocele e cancro della laringe, Oto-rino-laring. ital. **12**:416, 1942.

4. Zöllner, F.: Über das Kehlsackempyem, Beitr. Anat., Physiol., Path. Therap. d. Ohres **30**:274, 1932.

5. Schall, L. A.: Laryngocele—Associated with Cancer of the Larynx, Ann. Otol. Rhin. & Laryng. **53**:168, 1944.

6. Casadesús, F., and Capellá, G.: Laryngocele: 4 Cases, Acta Otorinolaryng. ibero-amer. **2**:5, 1951.

7. Marschik: Sekundäre Laryngocele bei Carcinoma laringis, Zentralbl. Hals, Nasen. **10**:104, 1927.

Cova,[8] in 1941, was the first to carry out a study based on roentgenological demonstration of the appendix of the laryngeal ventricle of Morgagni. A similar contribution by Leborgne [9] appeared shortly thereafter. Some years later, during studies of tuberculosis of the larynx, Cova drew attention to the fact that in pathological larynxes the ventricular appendix may be observed, under x-ray examination, to be inflated more frequently than it is generally in healthy persons. In healthy persons the appendix may be demonstrated only by increasing the aerial pressure in the larynx.

Cova thinks that the spontaneous evidence of an inflated ventricular appendix can lead one to suspect the presence of edema or of a deep infiltration, especially at the level of the neck of the appendix itself.

This is explained as due to the presence of a valve-like mechanism produced by stenosis of the neck of the appendix which allows the entrance and not the exit of air when, under hyperpressure, sneezing, coughing, etc., it is forced into the ventricle. The same interpretation was later presented by O'Keefe [10] (1951). Meda [11] and Guenzi [12] in 1951 described roentgenological demonstration of laryngocele in cancer of the larynx.

The ventricular expansion in the pathological larynx may be roentgenologically demonstrated with the larynx in the resting position. But since sometimes the condition becomes evident only after forced inflation, it is useful to make an examination first in the resting position and second during phonation or forced expiration.

From the roentgenological point of view, the laryngocele appears as a highly transparent image projected over the laryngeal and paralaryngeal structures. As long as it remains within the limits of a simple extension of the ventricular appendix, it appears as a club-shaped image which rises more or less vertically from the anterior extremity of the ventricle.

In a frontal roentgenogram the shadow of the larynx is hidden by that of the vertebral column, which is right behind it. In this projection the image of an internal laryngocele is therefore confused with that of the aerial contents of the pharynx, while the image of the external laryngocele is clearly evident.

A roentgenogram may be made according to Rheti's method, which excludes the vertebral column by placing the plate in the hypopharynx, or according to Smerchinich's technique, which displaces the larynx sideways by means of an oblique projection. But these methods are not always easy to carry out, and in any case are not commonly used.

8. Cova, P. L.: Sulla dimostrazione radiologica dell'appendice del ventricolo laringeo del Morgagni, Radiol. med. **28**:313, 1941; Gli aspetti radiologici della tubercolosi laringea, ibid. **31**:95, 1944; Valutazione critica del metodo stratigrafico nel carcinoma laringeo, ibid. **33**:505, 1947; L'orientamento del radiologo nella cura del cancro laringeo, Atti XV Congresso Naz. Soc. It. Radiologia, Cortina d'Ampezzo, 1948; L'indagine stratigrafia nello studio dei tumori della laringe, Lezioni, I Corso aggiornamento sulla stratigrafia, Genoa, 1950.

9. Leborgne: Radiologia, 1941.

10. O'Keefe, J. J.: Laryngocele, A. M. A. Arch Otolaryng. **54**:29, 1951.

11. Meda, P.: Il cancro del ventricolo laringeo di Morgagni. Atti XXXIX Congr. Soc. It. Laringol., Cagliari, 1951.

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On the simple roentgenogram in lateral projection, the image of the laryngocele generally crosses the outline of the inferior half of the laryngeal face of the epiglottis, at times simulating a loss of substance. Similar images have at times been erroneously interpreted as ulcerative processes.

On a frontal stratigram, the normal or the slightly expanded appendix of the ventricle appears in the anterior sections as a fissure which prolongs the ventricular

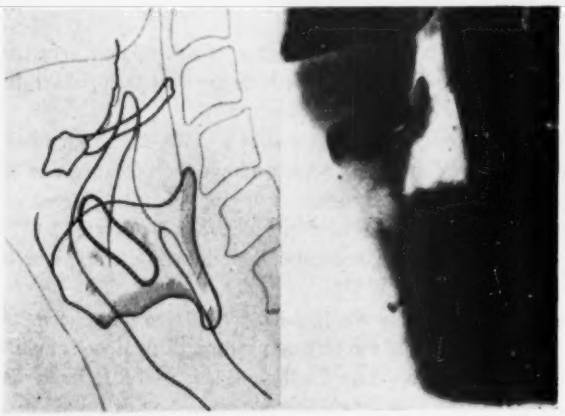

Fig. 1 (Case 1).—Lateral roentgenogram of larynx showing laryngocele directed upward and forward.

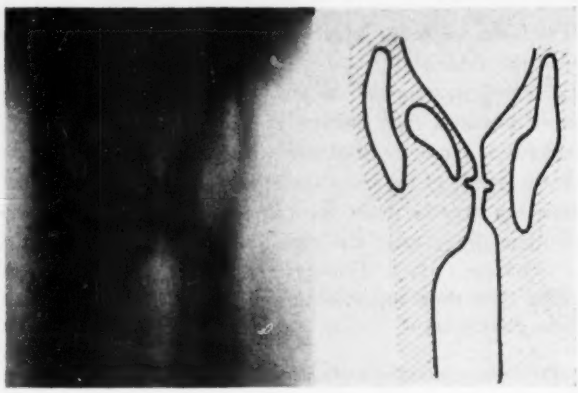

Fig. 2 (Case 1).—Stratigram of larynx with cancer of ventricle, showing internal laryngocele in right aryepiglottic fold.

outline upward and which extends in the aryepiglottic wall corresponding to the lateral side of the vestibule.

When the laryngocele is markedly developed, its image may be observed projected over the higher portions of the larynx in proximity to the free edge of the aryepiglottic fold or close to the body of the hyoid bone. When the laryngocele has expanded beyond the thyrohyoid membrane, it appears projected over the soft parts of the neck. In all these cases, its image no longer has the shape of a club but

that of a sac with one or several expansions. A peduncle is attached to it which connects it to the ventricle.

In the presence of a laryngocele extending into the larynx, the roentgenological outlook of the lateral wall of the vestibule on a frontal stratigram may be modified, a clear image appearing superimposed on the shadow of the aryepiglottic wall of the ventricular band.

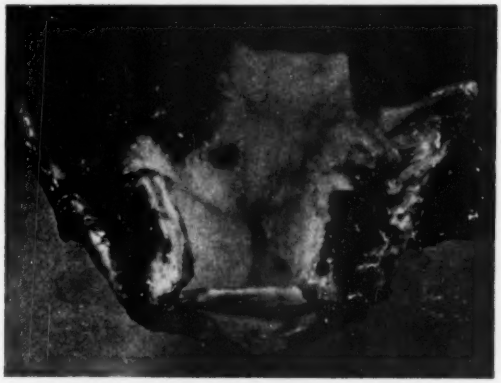

Fig. 3 (Case 1).—Surgically removed larynx. Submucous infiltration in upper and right subglottic regions is evident.

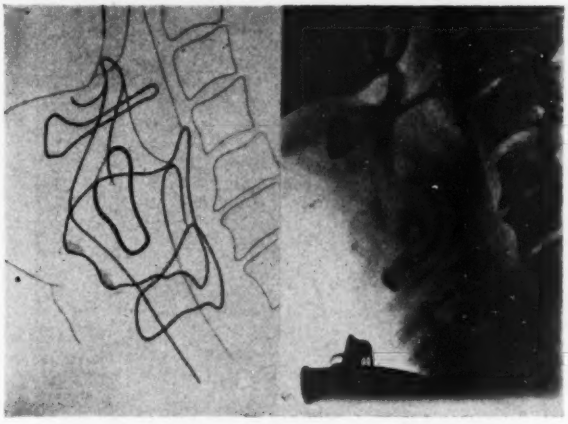

Fig. 4 (Case 2).—Lateral roentgenogram of larynx showing laryngocele directed upward and forward.

The presence of neoplastic formations developing around the neck of the laryngocele may be roentgenologically demonstrated when, besides the deformities of the larynx common to these cases, a modification of the aspect of the neck of the laryngocele may also become evident in the form of a stenosis or of a disappearance of the neck itself. In view of such findings it must be admitted that the patency of the neck, although altered, still persists, as otherwise the presence of the air in the sac could not be explained.

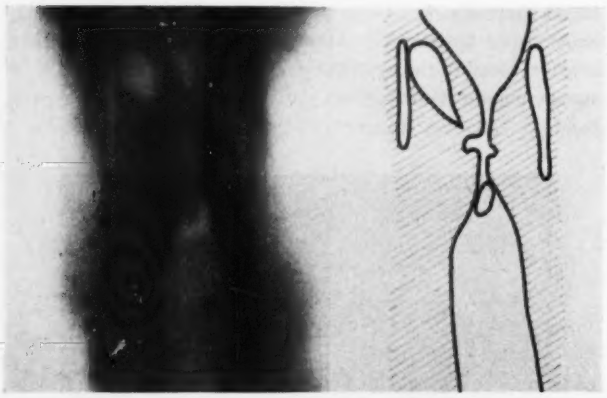

Fig. 5 (Case 2).—Stratigram of larynx with cancer of ventricle showing internal laryngocele in right aryepiglottic fold.

Fig. 6 (Case 2).—Surgically removed larynx. Tumor breaks through ventricle. Tumefaction of right aryepiglottic fold where laryngocele was located.

Since, as was previously stated, the image of a laryngocele appears normally on the roentgenogram only when roentgenography is carried out under conditions of aerial hyperpressure in the larynx such as those obtained during phonation or forced insufflation, the finding of such images on the roentgenograms executed in the absence of these conditions must lead one to admit the existence of a valve-like

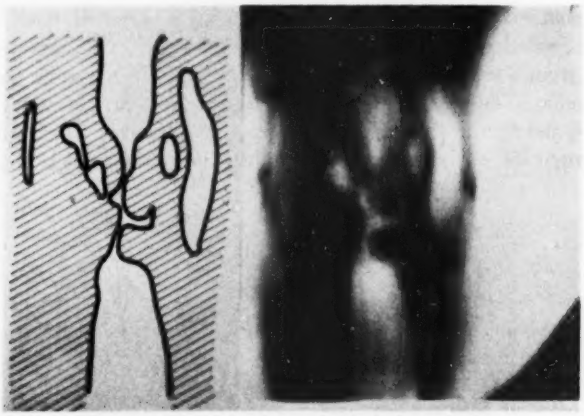

Fig. 7 (Case 4).—Stratigram of larynx with cancer of vestibule and of ventricle and small bilateral laryngocele.

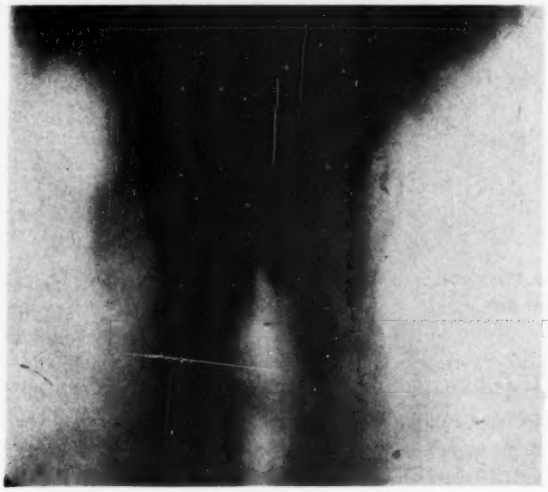

Fig. 8 (Case 5).—Stratigram of larynx with cancer of vestibule and of ventricle showing laryngocele projecting through right thyrohyoid membrane.

stenosis at the level of the neck impeding the normal emptying of the sac or of a rigidity of the walls of the sac.

At our clinic we have observed 650 cases of cancer of the larynx studied from both the clinical and the anatomic point of view. In six cases a laryngocele was present; in four of these cases the demonstration was exclusively roentgenologic.

The roentgenologic examinations were done in the lateral projection with the common technique, on larynxes in the resting position, and with the stratigraphic technique executed on frontal planes on larynxes during phonation.

In the first three cases the laryngoscopic picture showed that the site of the tumor was most probably in the ventricle, but showed no signs of laryngocele. In all these cases the anatomic specimen confirmed the laryngoscopic diagnosis (Figs. 3 to 6). On roentgenologic examination the laryngocele presented itself in the shape of a club, of limited size, contained within the thickness of the aryepiglottic fold, growing out from the anterior portion of the ventricle, in the same fashion as the normal appendix. The picture in two cases was clearest in the lateral projections (Figs. 1, 2, 4, and 5). In the fourth case, anatomic control of which was not available, the laryngocele was small and bilateral, as the tumor, which appeared to be

Fig. 9 (Case 5).—Surgically removed larynx showing large infiltration of vestibule and of right ventricle.

diffused in the laryngeal vestibule, had spread to the opposite side through the anterior commissure. The aerial sacs were here not visible on the simple lateral roentgenograms, owing to their limited extension and to the presence of infiltrative and ulcerative processes which altered the roentgenological picture of the larynx. On the other hand, they were very clearly shown on the frontal stratigrams (Fig 7).

The fifth case was endoscopically interpretable as a tumor of the vestibule. The anatomic specimen, in fact, revealed the presence of a simultaneous invasion of the region of the ventricle and of the upper vestibule (Figs. 9 and 10). The laryngocele was large, and it projected as a big external sac which had pierced through the thyrohyoid membrane (Fig. 8). This large externalization made the clinical diagnosis possible prior to the roentgenologic examination, owing to the evident presence of a cervical tumefaction.

In the sixth case the tumor was located in the ventricle; the laryngocele was bilateral, projected into the larynx, was in the cervical region, and appeared on the simple lateral roentgenogram and on the frontal stratigrams (Fig. 11).

Fig. 10 (Case 5).—Frontal section of larynx. Ventricular tumor diffused to the upper vestibule is evident; also laryngocele strangled between thyrohyoid cartilage and hyoid bone.

Fig. 11 (Case 6).—Stratigram of the larynx showing bilateral laryngocele.

If we consider the results of our examinations, we are led to believe that the laryngocele in laryngeal cancer is less rare than it is generally thought. It must be stressed that when the laryngocele has a limited extension its presence would not have been clinically noticed without the roentgenologic investigation.

Cova was the first, as far as I am aware, to call attention to the importance which the roentgenological finding of a laryngocele in cancer of the larynx can have as a sign of localization, namely, as a sign of the probable existence of an infiltration around the ventricle or in the upper and lateral portions of the vestibule.

In all our cases anatomic study has demonstrated the neoplastic involvement of the region of the ventricle and therefore has given further support to the value of this assertion. It appears that the presence of the laryngocele is sufficient to make a diagnosis of a tumoral involvement of the ventricle in the sense of both a primary and of a secondary tumor. However, in many cases the tumor has been demonstrated to be primary.

The diagnosis of a ventricular site of the growth can be supported by the presence of endoscopic data, which are generally represented by a tumefaction of the ventricular band, by vegetations coming out from the opening of the ventricle, and by infiltrations and ulcerations occupying the ventricular region. Furthermore, this diagnosis can be strengthened by certain roentgenological aspects which, according to Cova, point with all probability, to a ventricular site of the growth.

These aspects may be evident in the frontal stratigrams; they consist of a thickening of the region of the lateral vestibule in which the ventricle is contained and of a modification of the outline of the subglottic region; on the affected side it appears as leveled out, owing to the disappearance or to the reduction of the curve which, together with that of the opposite side, gives to this region the typical figure of a glove finger (Fig. 2). When the infiltration, instead of being deep in the ventricle, is located near the surface of the vestibule, the above-mentioned deformation of the subglottic region is generally absent.

SUMMARY AND CONCLUSIONS

The possibility of an association of a laryngocele and a cancer of the larynx has been shown. Although up to a few years ago such association was considered exceptional, it can today be demonstrated with greater frequency, owing to the systematic use of roentgenological examination in the study of laryngeal cancer. This is the case particularly with the small laryngoceles which cannot be revealed through a simple clinical examination.

These laryngoceles may form only when the region of the ventricle at the level of its neck is affected, causing a valve-like closure which allows the penetration of air but not its exit. An expansion of the ventricle is thus caused which ultimately leads to the formation of the laryngocele.

As a result of personal studies, I can further state that the presence of a laryngocele is in itself a definite sign pointing toward a diagnosis of primary or secondary tumor of the ventricle. This diagnosis becomes more certain when all other endoscopic or roentgenologic findings lend support to the conviction of a ventricular localization of the tumor.

Case Reports

GRANULOMA OF LARYNX FOLLOWING INTUBATION

Spontaneous Recovery

LESTER A. BROWN, M.D.
ATLANTA

CASES of granuloma of the larynx following intubation have been reported in the literature. The case presented here is the second one to be reported in which recovery was spontaneous, and it seems to be the first reported case in which spontaneous recovery occurred in a patient with bilateral granuloma.

REPORT OF CASE

In the first part of December, 1951, Mrs. A. E. G., aged 29 years 8 months, was in an automobile accident in which she received lacerations of the lower part of the face. Dr. Charles P. Yarn, the attending plastic surgeon, stated that the repair was done with the aid of combined intravenous and inhalation anesthesia, the latter administered through an endotracheal tube passed through the nose. According to Dr. W. H. Galvin, Chief of the Department of Anesthesiology of the Emory University Hospital, the endotracheal tube was "portex" plastic, Magill type, size 6. There was not any noticeable difficulty in the passage of the tube into the trachea. The tube remained in place for approximately 1½ hours. There was some bleeding from the patient's mouth following the operation, but no significance was attached to this, since the lower lip and lower gum were involved in the lacerations and the repair. Her throat was moderately sore for one week after the operation. Six weeks after the operation, she noticed that her "voice was fading."

On March 5, 1952, some three months after her accident, the patient came to my office, with the complaint of hoarseness, and she stated that two physicians had told her that the trouble had originated from the use of the endotracheal tube. Her obstetrician reported that, as of this date, she was in good general health, her reaction to the Kahn blood test was negative, and she was approximately four months pregnant. This fact would mean that she was probably 4 weeks pregnant at the time of the accident and about 10 weeks pregnant at the time of the onset of the hoarseness. She has two other children, aged 6 years and 2 years, but she had not had a similar attack of hoarseness.

On examination at the first visit, two granulomata of the larynx could be seen, one on the free edge of the vocal process of each arytenoid cartilage. The tumor on the right side was larger than that on the left, and they appeared to measure at their widest diameters probably 5 mm. and 4 mm. They were pedunculated, and they moved above and below the true vocal cords with forced respiration. The husband stated that the patient had wheezing respiration while she was asleep.

She was advised to have surgical removal of the tumors, but she stated that she "felt so ill" because of the nausea and vomiting of pregnancy, which was still present, that she would rather delay any surgical procedure, unless it came to a state of emergency. At her request, she was followed at two- to four-week intervals until April 30, 1952, at which time there had not been any noticeable change in the tumors in at least four weeks. The patient still preferred to complete her pregnancy before considering treatment of the laryngeal pathologic condition.

Forty-one days later, on June 10, 1952, the patient appeared at my office for the purpose of having a routine laryngeal checkup. Her voice was clear. She stated that her voice had cleared, so far as she knew, in a gradual manner. Her husband stated that she no longer made any unusual respiratory noise while she was sleeping. On examination, there were no

granulomata to be seen on the larynx. The patient denied having had any treatment for her throat since her last visit to my office, and she stated that she had not seen any physician in that interval except her obstetrician. He had mentioned that her voice was clearer. Further, she denied having had any severe coughing attack or coughing up anything other than plain sputum, and not at any time had there been bleeding from her throat. Repeated careful mirror examination of the larynx revealed the presence of a tiny knob on the free surface of the vocal process of each arytenoid cartilage where before had been seen the attachments of the granulomata. These were so small that they might have been easily overlooked. One month later, there had not been any recurrence.

COMMENT

According to the literature, there have been more than a dozen reports of cases of granuloma of the larynx following intubation since the first report by Clausen,[1] in 1932. His was the only case in which the patient had spontaneous cure, and, in this instance, the patient "coughed up the entire tumour, which was the size of a small pea." The microscopic examination, however, did not show tissue commonly found in these tumors when removed by surgical procedure, but, indeed, the results of the microscopic examination of Clausen's "tumour" were more in keeping with the characteristics of a blood clot. Wattles,[2] in 1949, summarized the literature to that date and agreed that this tumor is of traumatic origin and that "removal is facilitated by waiting, when expedient, until the growth has become pedunculated." McLaurin [3] operated upon a patient with bilateral granuloma and obtained a cure of the pedunculated growth, but there was a recurrence of the growth which was not pedunculated. He then waited for the latter to regrow and to become pedunculated, and the second operation was successful. Kearney [4] reported a case in which respiratory embarrassment due to bilateral granulomata became an emergency, necessitating immediate removal of the offending masses. He suggested "that the lesion may generally originate in a traumatic ulcer of the cord exposing the superficial cartilaginous vocal process of the arytenoid," and that, as a granuloma forms and grows, the ulcer heals slowly from the periphery. The increasingly smaller base, he continued, leads to the formation of a pedicle, and, when sufficient healing has occurred, there may result self-amputation of the tumor. This logic could be applied to my case, and it seems reasonable that the tumors could amputate themselves without the knowledge of the patient, and, indeed, without bleeding. It would seem, however, that, with the separation of the tumors, there would be a noticeable sudden change in the patient's voice. An explanation might be that the larger tumor separated first. This occurrence would result in improvement, but not a return to normal, of the patient's voice and respiration. The separation of the smaller mass at a later time would complete the vocal cure, thus giving the patient the feeling that the process of recovery was gradual.

1. Clausen, R. J.: Unusual Sequela of Tracheal Intubation, Proc. Roy. Soc. Med. **25**:1507 (Aug.) 1932.

2. Wattles, M.: Bilateral Granuloma of the Larynx Following Intratracheal Anesthesia, Ann. Otol. Rhin. & Laryng. **58**:873-882 (Sept.) 1949.

3. McLaurin, J. W.: Bilateral Granuloma of Larynx Following Endotracheal Anesthesia, Laryngoscope **57**:796-800 (Dec.) 1947.

4. Kearney, H. L.: Bilateral Granuloma of Larynx Following Intratracheal Anesthesia, Ann. Otol. Rhin. & Laryng. **55**:185-187 (March) 1946.

SUMMARY

Another case report of granuloma of the larynx following intubation is added to the literature.

It is the second reported case in which recovery was spontaneous and, seemingly, the first reported case in which spontaneous recovery occurred in a patient with bilateral granuloma.

Further evidence is added to the supposition that the degree of peduncular formation of the tumor is diagnostic of the amount of healing that is going on in the basic traumatic lesion.

137 Doctors Building.

LIPOMA OF THE HYPOPHARYNX PRODUCING MENACING SYMPTOMS

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AND
LESTER WOLFF, M.D.
NEW YORK

BENIGN neoplasms of the hypopharynx occur infrequently and may grow to relatively large dimensions without being detected. However, symptoms do result from encroachment of the tumorous mass on the laryngeal airway or the esophageal lumen. The commonest of these benign tumors is the fibrolipoma, which may be single or multiple, sessile or pedunculated.

In 1934, Kramer [1] reported 26 such instances. Since that time, a review of the literature revealed seven additional cases of fibrolipoma [2] indicating the infrequent occurrence of this tumor in the hypopharynx. Eggston and Wolff [3] found true lipoma in the pharyngeal region rare, although occasionally such a neoplasm is situated at the base of the tongue.

Pedunculated tumors, having a limited attachment by a narrow pedicle to the cricoid, may hang suspended in the esophageal lumen and thus not be visualized by mirror examination. In such circumstances, the fibrolipoma can produce either esophageal symptoms by interfering with swallowing or respiratory difficulty by sudden dislodgment of the growth into the laryngeal lumen following gaseous eructation. One such tumor recently went undiagnosed for many years before sudden respiratory embarrassment hastily brought the patient to the hospital.

REPORT OF CASES

CASE 1.—H. B., a 52-year-old white man, was admitted to Beth Israel Hospital on June 14, 1950, with the alarming complaint of a transient attack of sudden dyspnea with threatened asphyxiation. This sense of impending suffocation first occurred about 8 hours before admission, lasted for about 30 seconds, and was relieved spontaneously.

The patient stated that his symptoms dated back some 25 years, when the ingestion of cold food would induce a spasmodic cough. In time, he noticed that various other foods would

From the Department of Otolaryngology, Beth Israel Hospital.

Read before the New York Academy of Medicine, Section of Otolaryngology, April 17, 1951.

1. Kramer, R.: Multiple Fibrolipomata of the Hypopharynx and Esophagus, Ann. Otol., Rhin. & Laryng. **43**:881-883 (Sept.) 1934.

2. Laskiewicz, A.: Sur les lipomes pédiculés du pharynx: Description de deux observations personnelles, Rev. laryng. **57**:717-724 (June) 1936. New, G. B., and Erich, J. B.: Benign Tumors of the Larynx: Study of 722 Cases, Arch. Otolaryng. **28**:841-910 (Dec.) 1938. Carco, P.: Su un caso di grosso lipoma dell'ipofaringe, Oto-rino-laring. ital. **9**:239-244 (May) 1939. Smith, R.: Polypoid Fibro-Lipomatosis Pharyngis, J. Laryng. & Otol. **55**:546-548 (Dec.) 1940. Ogata, M.: Ein Fall von polypösem Fibrolipom, entstanden an der hinteren Rachenwand, Oto-rhino-laryng (Abstr. Sect.) **14**:8 (Feb.) 1941. Davison, F. W.: Fibrolipoma of the Laryngopharynx, Ann. Otol. Rhin. & Laryng. **51**:853-854 (Sept.) 1942.

3. Eggston, A. A., and Wolff, D.: Histopathology of the Ear, Nose and Throat, Baltimore, Williams & Wilkins Company, 1947.

initiate a similar coughing episode. The spasm would be relieved eventually by eructation and the expulsion of small food particles.

In trying to determine the cause of this cough, he consulted his physician and was advised that he had post-tonsillectomy scar tissue in the posterior pharynx which disturbed the movements of the pharyngeal musculature during deglutition, with incomplete closure of the tracheal orifice. In 1946, a routine examination of the larynx because of an acute upper respiratory infection revealed a small tumor mass in the piriform fossa. This mass was removed by indirect laryngoscopy under local anesthesia and the microscopic report was fibrolipoma. After this procedure, there seemed to be considerable abatement of his cough.

In 1949 the patient was hospitalized for an acute coronary occlusion. After subsidence of his acute illness, he began to experience difficulty in swallowing and complained of having the

Fig. 1.—Esophagram showing large filling defect in the left hypopharynx and upper esophagus. The tumor was probably partially dislodged from the esophageal lumen during this exposure.

feeling of a foreign body in his throat. During his convalescence in a private sanatorium, an esophagram was made because of the persistent dysphagia. The esophagram showed a large filling defect, about 8 cm. in length, in the hypopharynx and upper part of the esophagus. Roentgenologically, this defect was interpreted as being caused by a large tumor mass (Fig. 1). External operation was strongly advised at this time on the supposition that a malignant intrinsic lesion of the esophagus existed, but the patient refused this procedure.

Nine months after discharge from the sanatorium, corresponding to the day of admission to the hospital, the patient, while bending over to tie his shoe, experienced a severe attack of sudden dyspnea with a sense of complete asphyxiation. This episode lasted about 30 seconds and was relieved spontaneously. Because of the fear of a similar recurrence of the laryngeal obstruction, the patient insisted on hospitalization.

Physical examination showed a normal man, not in respiratory distress but very apprehensive. Findings on the general examination were negative except for the presence of hypertension, the blood pressure being 184/104. Indirect laryngoscopic examination revealed a large, rounded, smooth tumor covered by an intact mucosa overhanging the left arytenoid. The hypopharyngeal mass occupied the left piriform fossa and only slightly impinged upon the laryngeal lumen posteriorly. No ulcerations were visible and the cords moved freely without any evidence of recurrent nerve paralysis. The laryngeal airway was adequate. Although there was a history of coronary disease, which, itself, could produce dyspnea, it was considered unlikely that the

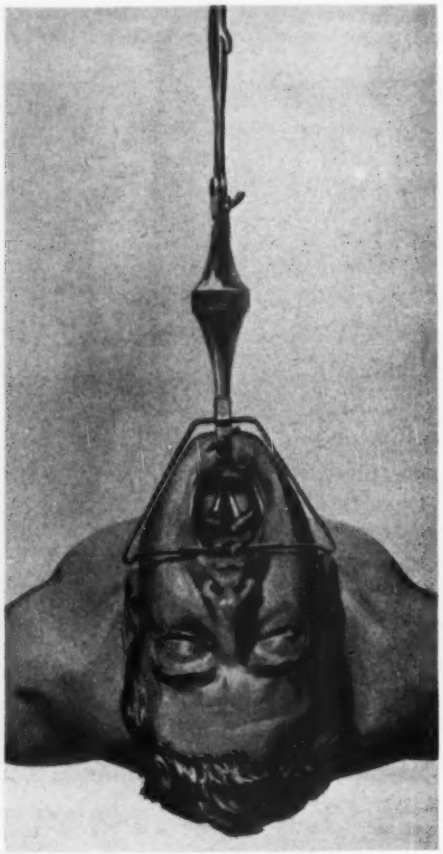

Fig. 2.—Suspension laryngoscopy representing the initial view of the smooth, round mass overlying the left arytenoid.

heart was responsible for the sudden dyspnea, in view of the local laryngeal lesion. The presence of a pedunculated tumor in the hypopharynx emphasized the inherent danger of a repetition of the laryngeal episode. Because of the likelihood of such recurrence, especially in a patient with a recent severe coronary occlusion, a prophylactic tracheotomy with local anesthesia was done on the day of admission.

On June 16, two days following admission, suspension laryngoscopy was performed with the patient under thiopental (pentothal®) sodium (administered intravenously) and curare anesthesia. Upon exposure of the larynx there was noted a large, rounded, pedunculated tumor attached to the posterior surface of the left arytenoid (Fig. 2). The tumor mass was suspended

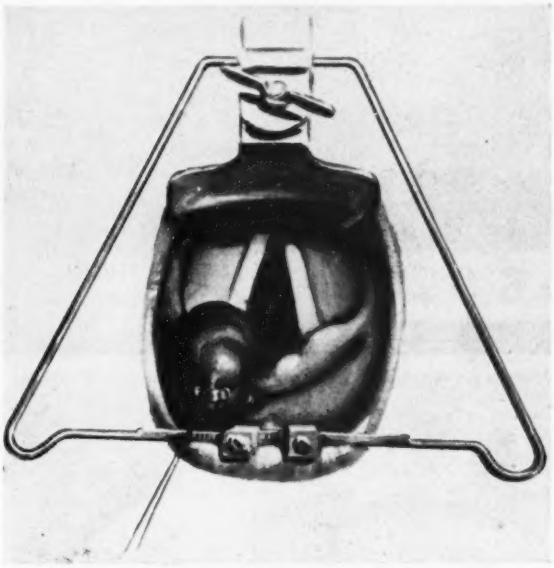

Fig. 3.—Michel's clips anchored by black silk are buried into the substance of the tumor. Traction on the silk helped to deliver the mass from its bed in the esophagus.

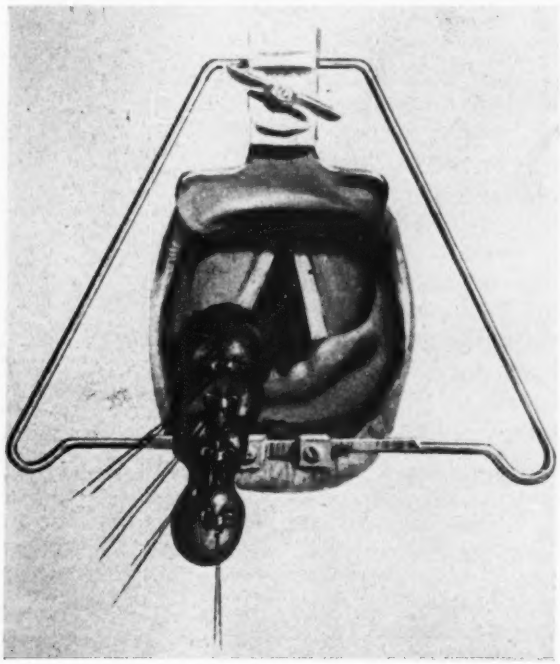

Fig. 4.—The pedunculated tumor has been dislodged into the oropharynx and can now be severed from the arytenoid by means of a diathermy snare.

Fig. 5 (Case 1).—Surgical specimen of the lipomatous tumor in which fatty tissue could be recognized under the smooth, thin mucosa. The rounded end represents the most dependent portion of tumor, which was suspended in the esophageal lumen.

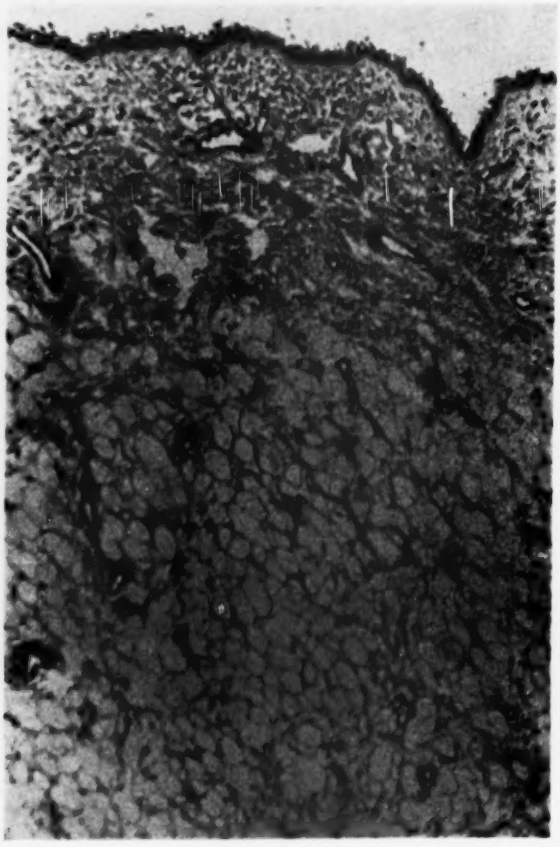

Fig. 6 (Case 1).—Microscopic section showing the lipomatous structure of the tumor. The intact mucosa overlying the neoplasm is visible.

lengthwise in the lumen of the esophagus and presented considerable resistance to being dislodged. Michel clips, anchored with long black silk thread, were placed along the tumor. The mass was delivered from its bed and brought into the oropharynx (Fig. 3) by traction on the silk.

The attachment of the tumor to the arytenoid was severed by a spare, and the base of the tumor was coagulated with diathermy (Fig. 4). Decannulation was done on the fifth day; the patient made an uneventful recovery and has remained symptom-free until today.

The specimen was an elongated, lobulated tumor about 7.5 cm. long, varying from 1.5 to 2.5 cm. in diameter (Fig. 5). It was covered with a thin, pale, light-purple mucosa through which pale, fat tissue could be recognized.

Microscopically, the surface was covered with a stratified squamous epithelium (Fig. 6). Separated from the mucosa by a loose layer of connective tissue was a diffuse, fatty, lobulated tumor mass. The cells were of the adult type, characteristic of lipoma.

Fig. 7 (Case 2).—Surgical specimen of the lipoma. The sessile base of the tumor, surrounded by the reflected mucosa which covers the presenting portion of the tumor, can be seen.

Sessile benign tumors seem to grow slowly and may present symptoms of gradual encroachment upon the laryngeal airway only after attaining a relatively large size. The following case is illustrative.

CASE 2.—B. R., a 64-year-old white man, entered the Beth Israel Hospital on May 14, 1951, with the chief complaint of labored breathing and a tickling sensation of four months' duration in his throat. The history dated the onset of the dyspnea to a bout of bilateral bronchopneumonia for which the patient received antibiotic therapy. Previously, he had had an incision and drainage of the left pleural cavity for empyema. In view of the past and most recent lung infections, the patient's dyspnea was attributed to his decreased lung capacity. However, the complaint of a tickling sensation in his throat persisted.

The patient was referred for further investigation. Indirect examination of the larynx revealed a large sessile tumor mass arising from the left aryepiglottic fold and obliterating the left vallecula. The epiglottis was pushed to the right, and the piriform fossa was hidden. The mucosa was everywhere intact, and the tumor mass partially distorted the laryngeal opening by displacing the structures to the right.

Fig. 8 (Case 2).—Cut surface of the tumor, showing the homogenous, glistening appearance which is characteristic of lipomata.

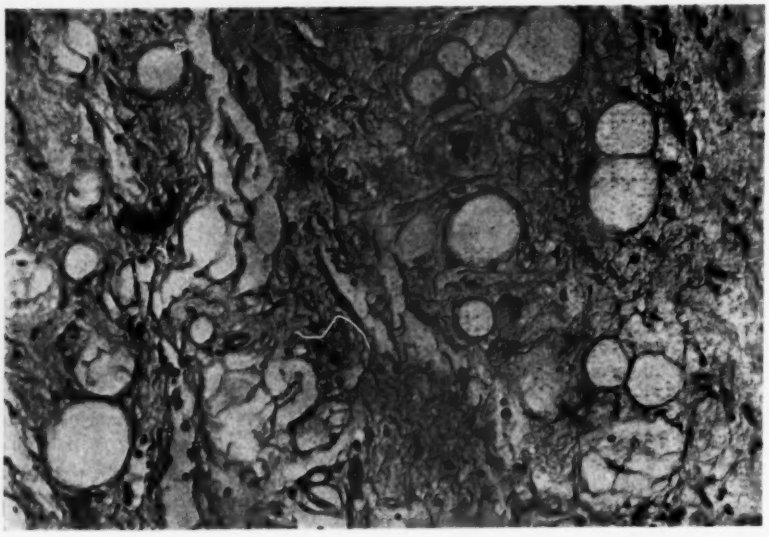

Fig. 9 (Case 2).—Microscopic section of the tumor. The typical histology of pure lipoma is here demonstrated.

With the patient under thiopental-curare anesthesia, a suspension laryngoscopy was performed, and a large, smooth, yellowish mass presented itself. The tumor was covered with an intact mucosa and was attached by a sessile base to the left aryepiglottic fold, the epiglottis, and the vallecula. The neoplasm was grasped with a Lynch grasping forceps and pulled to one side. An incision was made with a scalpel through the mucosa which enveloped the base of the tumor, and the mucous membrane was reflected from the capsule of the mass. Scissors were employed to free the capsule of the tumor from its bed, and a diathermy snare was used to sever the sessile base.

The surgical specimen (Fig. 7) was oval and measured 4.5 cm. in its longest diameter and 3.5 cm. in width. The cut surface had the yellowish appearance of a lipoma (Fig. 8). Microscopic section revealed the lipomatous structure (Fig. 9).

COMMENT

Lipomata of the hypopharynx occur infrequently and may exist for a long time without detection. They may, however, cause alarming symptoms of respiratory distress and disturbances of deglutition. Even with a recent history of coronary thrombosis or pulmonary disease, examination of the hypopharynx is indicated to exclude local pathology which could account for the respiratory distress.

Removal of such relatively large tumors from the hypopharynx is probably best effected by means of suspension laryngoscopy. This procedure not only permits the use of both hands for manipulation but also allows ample time for careful removal without fatigue or hurried surgery. Michel's clips, tied to silk ligatures and anchored to the tumor, have proved helpful in delivering the neoplasm.

121 E. 60th St.

Clinical Notes, New Instruments and Techniques

NEW MIDDLE EAR ASPIRATOR FOR TREATMENT OF OTITIS MEDIA WITH EFFUSION

G. HOWARD GOTTSCHALK, M.D.
LOS ANGELES

Aspiration of the middle ear was first described by Trowbridge [1] as a new treatment of acute aero-otitis media. This method is applicable also in cases of serous effusion in the middle ear which commonly occur during the course of or after an acute upper respiratory infection. Conservative treatment consisting of vasoconstrictors and middle ear inflation will clear up many of these conditions within two weeks. However, one or two aspirations not only afford immediate relief of symptoms but will markedly hasten recovery. Myringotomy is no longer indicated in serous effusion, as it is far more traumatizing and less effective than aspiration. Using the technique as described in this presentation, the surgeon can remove the fluid without risk and with practically no discomfort to the patient.

The method of middle ear aspiration, as originally described by Trowbridge, required the aid of an assistant to withdraw the plunger of the syringe because both hands of the operator were in use holding the ear speculum and the syringe. Also, after a portion of the fluid was aspirated, negative pressure built up in the tympanic cavity prevented complete evacuation of the fluid. For these reasons this technique was not universally accepted. The following year a spring-activated device [2] was introduced which held the syringe and automatically withdrew the plunger. Then, in June, 1951, Seltzer [3] described a special double-bored needle which allowed air to enter the tympanum as the fluid was withdrawn, thereby preventing the build-up of negative pressure within the middle ear. Thus, in the attempt to overcome the disadvantages of the original technique, others have arisen. The extra-large diameter of the double-barreled needle is unnecessarily traumatic to the drum membrane, and the syringe holder is clumsy, interfering with the delicate control of the needle necessary to perform the operation with a minimum of trauma to the middle ear mucosa and tympanic membrane.

The aspirator [4] presented in this paper permits the operator to withdraw fluid from the middle ear unhampered by negative-pressure build-up, using a fine single-bored needle, and to perform the entire operation without the aid of an assistant and with a minimum of trauma.

The instrument is essentially a calibrated glass trap with a needle hub on one side and a rubber tube on the other. It is manipulated with the right hand; the left maneuvers the ear speculum, so that the tympanic membrane can be visualized throughout the entire procedure. The rubber tube is held between the lips, so that the moment the needle punctures the tympanic membrane mouth suction can be started. When negative pressure begins to retard the flow of fluid, suction is released, air enters the tympanic cavity, and then suction is again started. This cycle is repeated until no more fluid is obtainable. The needle is then withdrawn, and the operation is finished.

A special short bevel, 2½-in. (6.3-cm.) needle should be used, in order that the lumen can be entirely within the tympanum without the point touching the medial wall. Either the 22-gauge or the 20-gauge needle is used, depending on the viscosity of the fluid. I prefer first trying the thinner needle. If it proves too fine, then the larger-diameter needle can be used and is introduced through the same perforation.

1. Trowbridge, B. C.: A New Treatment of Acute Aero-Otitis Media, Arch. Otolaryng. **50**:255 (Sept.) 1949.

2. Trowbridge, B. C.: Ear Aspirator and Injector, Arch. Otolaryng. **51**:928 (June) 1950.

3. Seltzer, A. P.: Newly Designed Paracentesis Needle for Use in Aerotitis Media, A. M. A. Arch. Otolaryng. **53**:672 (June) 1951.

4. Manufactured by V. Mueller & Company, Chicago.

The patient should be seated comfortably in a chair, with the head firmly resting on a headrest and tilted down about 15 degrees below the horizontal. This position allows the fluid to accumulate in the anterior portion of the tympanum. The needle is inserted through the anteroinferior quadrant of the tympanic membrane near, but not through, the annulus. Both hands are braced firmly against the head for support. Thus, after the needle is introduced to the proper depth, there need be no further motion of either hand, and the entire procedure is carried out without the danger of the needle point being moved.

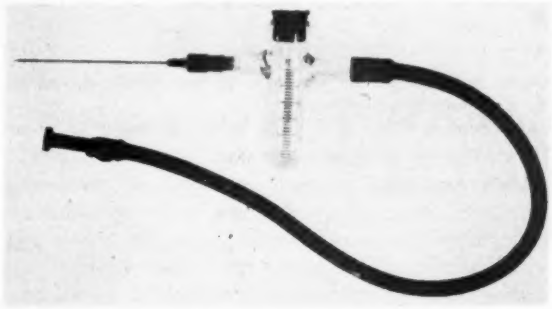

Fig. 1.—Aspirator.

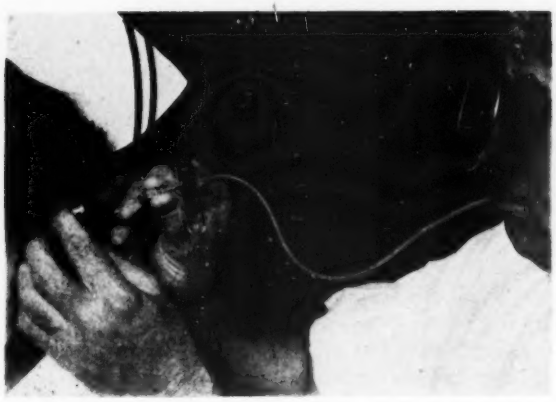

Fig. 2.—Aspirator in use.

The steps to be carried out are listed in order:

1. The aspirator, the two special needles, and an ear speculum are sterilized.

2. The ear canal and tympanic membrane are carefully and thoroughly cleansed with soap and water or with a detergent and painted with an antiseptic solution.

3. A topical anesthetic, such as Bonaine solution (cocaine, phenol, and menthol), may be applied to the anteroinferior quadrant of the tympanic membrane and allowed to remain for 10 minutes. Anesthesia, however, is not necessary, as the procedure is almost painless.

4. The area is then cleansed with alcohol, the patient's head is placed in the proper position, and the ear speculum is put in the canal and held with the left hand.

5. The tip of the aspirator tube is placed between the lips. The aspirator with the needle attached is held in the right hand.

6. The tympanic membrane is visualized, and the needle with the bevel directed anteriorly is slowly introduced through the anteroinferior quadrant. Suction is started, and as soon as the operator hears or sees the fluid flowing he fixes the position of the needle, thus avoiding the medial wall of the tympanum.

7. The intermittent suction is continued until no more fluid can be evacuated. The needle is then withdrawn and a cotton plug inserted in the canal to remain for 24 hours.

8. The patient should be seen again in three days, and if fluid has re-formed the operation is repeated.

SUMMARY

A new instrument is presented for aspiration of the middle ear which overcomes the objections of those previously described.

Myringotomy as treatment of serous otitis or aero-otitis should be discarded in favor of the less traumatizing aspiration technique.

6226 W. Manchester Ave. (45).

Progress in Otolaryngology

Summary of the Bibliographic Material Available in the Field of Otolaryngology from 1949 to 1951

TUMORS OF THE NOSE AND THROAT

FREDERICK A. FIGI, M.D.
AND
KENNETH D. DEVINE, M.D.
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TUMORS OF THE NOSE AND PARANASAL SINUSES

HILL [1] REPORTS a case of the extranasal type of congenital glioma of the nose and discusses the differences between this type and the intranasal and mixed types. He states that it is of practical importance to differentiate glioma from encephalocele of the nose, because an encephalocele may contain channels for cerebrospinal fluid and because death from meningitis has resulted after removal of a gliomatous encephalocele. Miller and Neidhardt [2] also report a case of extranasal glioma. Cuthbert [3] adds three cases of intranasal glioma, one of which is probably a case of glioma of both the intranasal and the extranasal type.

Miller and Moore [4] state that nasoalveolar cysts constitute a condition of which rhinologists should be more cognizant. These cysts are always found at the attachment of the alae of the nares. As the cysts increase in size, they encroach on the nasal vestibule and cause a swelling in the floor of the nose, elevating the anterior tip of the inferior turbinate and obliterating the nasofacial fold of the involved side. As growth increases, the swelling may be demonstrated at the gingivolabial junction. These cysts are of fissural origin, being derived from ectodermal rests. They occur almost exclusively in women.

Montreuil [5] records three cases of nasal vestibular cyst.

Erich [6] states that the treatment of external cancers of the nose is essentially the same as the treatment of cutaneous cancer elsewhere about the face. However, there are two points of difference. First, unless the lesion is extremely small, the removal of a cutaneous lesion on the nose by excision leaves a wound that cannot be closed by primary suturing without causing unsightly distortion of the nose. Second, the margins of a carcinoma that recurs after irradiation of the initial lesion are much less determinable when such a lesion occurs on the nose than when it

From the Section of Plastic Surgery and Laryngology, Mayo Clinic.

1. Hill, J. H.: Glioma of the Nose: Report of a Case of the Extranasal Type, Arch. Path. **48**:183-186 (Aug.) 1949.

2. Miller, G. V., and Neidhardt, H. W.: Extranasal Type of Nasal Glioma: Report of a Case, J. Pediat. **36**:798-800 (June) 1950.

3. Cuthbert, N. M.: Intranasal Gliomata, M. J. Australia **1**:46-48 (Jan. 14) 1950.

4. Miller, J. B., and Moore, P. M., Jr.: Nasoalveolar Cysts, Ann. Otol. Rhin. & Laryng. **58**:200-211 (March) 1949.

5. Montreuil, F.: Cysts of the Nasal Vestibule, Ann. Otol. Rhin. & Laryng. **58**:212-219 (March) 1949.

6. Erich, J. B.: Cancer of the Nose: Treatment and Plastic Repair, Laryngoscope **59**:839-857 (Aug.) 1949.

occurs in most other situations about the face. This characteristic is so because the malignant cells tend to divide and spread beyond the apparent external limits of the growth. Erich describes the various surgical procedures that may be necessary to reconstruct defects of the nose. The treatment must be varied, depending on the extent of the growth and the grade of malignancy of the lesion.

According to Wolfe and Platt,[7] osteogenic sarcoma has been produced experimentally by means of x-rays and radium. Osteogenic sarcoma of the nasal bones, however, is extremely rare. Only two cases could be found, one seemingly associated with trauma, the other following radiation therapy. They add two cases of osteogenic sarcoma involving the nasal bones, in both of which the lesions occurred after irradiation. The latent interval from the initiation of treatment to the onset of the sarcoma was 24 years in one case and 18 years in the other. In both cases, an antecedent history of low-grade cutaneous cancer, with normal underlying nasal bones was present. The usual irreversible cutaneous changes resulting from irradiation, such as persistent erythema and telangiectasis, were noted.

Stout and Kenney [8] present nine cases of primary plasma cell tumor of the oral cavity and upper part of the respiratory tract. After reviewing the literature, they conclude that anything from complete cure after simple excision or radiotherapy to rapid or slow appearance of multiple or solitary lesions of the bone marrow might occur in these cases. These tumors may be divided into the following six categories: (1) plasma cell granuloma; (2) benign localized plasmacytoma; (3) malignant solitary tumor; (4) malignant tumor with metastasis; (5) plasma cell myeloma, and (6) plasma cell leukemia. Investigators are unable to indicate how a lesion may be classified when it first appears as a swelling or polyp in the nasal or oral mucosa.

Maguda and Maiden,[9] Mattick,[10] Bernier and Tiecke,[11] and Parkes and Burtoff [12] record cases of plasmacytoma of the nasal cavity, Waldeyer's ring, and the maxillary sinus.

Lineback [13] reports nine cases of septal hemangioma seen during the past 22 years. The most frequent complaint was epistaxis, and the next commonest complaint was nasal obstruction. It is likeliest that these tumors arise from the highly vascular Little's area. This particular tumor is a lesion that occurs in adults. It is noninvasive and circumscribed and usually is composed of well-organized blood vessels of varying size and caliber.

7. Wolfe, J. J., and Platt, W. R.: Postirradiation Osteogenic Sarcoma of Nasal Bone: A Report of 2 Cases, Cancer **2**:438-446 (May) 1949.

8. Stout, A. P., and Kenney, F. R.: Primary Plasma-Cell Tumors of the Upper Air Passages and Oral Cavity, Cancer **2**:261-278 (March) 1949.

9. Maguda, T. A., and Maiden, S. D.: Plasmocytoma of the Nasal Cavity, Arch. Otolaryng. **51**:258-262 (Feb.) 1950.

10. Mattick, W. L.: Plasmocytoma: An Unusual Case with Progressive Involvement of Waldeyer's Ring and the Larynx, Bronchus and Pleura, Arch. Otolaryng. **51**:263-271 (Feb.) 1950.

11. Bernier, J. L., and Tiecke, R. W.: Tumors: Plasmocytoma, J. Oral Surg. **8**:70-72 (Jan.) 1950.

12. Parkes, M., and Burtoff, S.: Plasma Cell Tumor Simulating Bilateral Maxillary Sinusitis, Arch. Otolaryng. **50**:666-668 (Nov.) 1949.

13. Lineback, M.: Nasal Septal Hemangiomas: Report of 9 Cases, Ann. Otol. Rhin. & Laryng. **59**:699-702 (Sept.) 1950.

Sooy [14] states that primary septal tumors are uncommon. He is of the opinion that the importance of initial treatment cannot be stressed too strongly. This treatment should always be more extensive than would first seem indicated. Electrosurgery is a valuable adjunct in the treatment of septal tumors. He describes methods of supplementary intranasal radiation and mentions a new method of treatment with radioactive Co^{60}. He states that cytologic study of smears should be used routinely in all cases of malignant tumor of the nose and throat, because it is most useful in the evaluation of the effect of treatment.

Salinger [15] and Laff,[16] in separate papers, record two cases of mixed tumor of the nose. In the case reported by Salinger, the lesion arose from the inferior turbinate.

Chordomas in the maxillary antrum and nares are extremely rare. Rarer still is metastasis of chordoma to the cervical lymph nodes. Pastore, Sahyoun, and Mandeville [17] found only three reported cases in which there was metastatic involvement of the cervical lymph nodes. They add a case of chordoma of the maxillary antrum and nose in which the diagnosis was made by microscopic examination of tissue removed from a mass in the neck.

Dingley [18] states that antrochoanal polypus constitutes a separate clinical entity. Its origin, behavior, and pathology differ so widely from those of the commoner nasal polyps that it deserves to be considered apart. The true antrochoanal polypus is almost invariably single. It originates in the maxillary antrum and can be cured if the Caldwell-Luc operative technique is employed, so that both the intramaxillary and the nasal portions of the polypus can be completely eradicated.

Sage [19] describes three types of maxillary cysts: the radicular cyst, the follicular cyst, and the median maxillary cyst. Three methods of treatment are outlined, each of which is applicable in a certain type of case: (1) simple enucleation of the cyst lining; (2) enucleation of the lining, with production of a nasocystic window, and (3) removal of the wall of the posterior cyst and conversion of two cavities into one, with production of a nasoantral window.

Schuknecht and Lindsay [20] divide benign cysts of the paranasal sinuses into two groups: those arising from the mucosa of the sinuses and those of dental origin. The three types that arise from the mucosa of the sinuses are (1) the nonsecreting cyst, (2) the small glandular cyst, and (3) the mucocele. They state that the non-

14. Sooy, F. A.: Primary Tumors of the Nasal Septum, Laryngoscope **60**:964-992 (Oct.) 1950.

15. Salinger, S.: Mixed Tumor of Inferior Turbinate, Ann. Otol. Rhin. & Laryng. **58**:485-487 (June) 1949.

16. Laff, H. I.: Mixed Tumor of Nose Treated by Rhinoplastic Procedure, Ann. Otol. Rhin. & Laryng. **58**:488-493 (June) 1949.

17. Pastore, P. N.; Sahyoun, P. F., and Mandeville, F. B.: Chordoma of the Maxillary Antrum and Nares: Report of a Case Clinically Resembling Hodgkin's Disease First Diagnosed by Biopsy of a Cervical Node, Arch. Otolaryng. **50**:647-658 (Nov.) 1949.

18. Dingley, A. R.: Some Observations on Antro-Choanal Polypus, J. Laryng. & Otol. **63**:141-143 (March) 1949.

19. Sage, R. A.: Diagnosis and Treatment of Maxillary Cysts, Ann. Otol. Rhin. & Laryng. **58**:1068-1074 (Dec.) 1949.

20. Schuknecht, H. F., and Lindsay, J. R.: Benign Cysts of the Paranasal Sinuses, Arch. Otolaryng. **49**:609-630 (June) 1949.

secreting cysts arise as a result of chronic inflammation and that they rupture before external deformity is caused. The small glandular cysts are common in hyperplastic conditions of the mucosa and are probably due to obstruction of the duct by hyperplastic epithelium. Mucoceles may produce external deformity. The benign cysts of dental origin that may involve the maxillary sinus are follicular cysts and radicular cysts.

Wigh [21] states that the roentgenologic diagnosis of a mucocele can be made with relative ease when it first produces clinical complaints. An increase in radiotransparency in the region occupied by the mucocele is quite characteristic and, when present, is in great contrast to the normal density of the unaffected sinus. The lesions invariably appear round or oval when the roentgenogram is taken in the sagittal plane. No relationship is evident between the thickness, or density, of the margin of the bony envelope and any of the other features. The normal appearance of scalloping of the sinus never is seen at the periphery of these mucoceles. The normal shadow produced by the lining membrane of the sinus is absent. In most cases, the involved side is larger than the uninvolved side. In at least half of the cases reported by Wigh, the mucocele did not occupy the entire area of the sinus. In each instance in which sinus and cyst were not congruous, the mucocele was lateral to the residual identifiable sinus. Wigh is of the opinion that some mucoceles, supposedly originating in the frontal sinus, begin in the anterior ethmoid cells and, in fact, may be in the frontal bone lateral to and separate from the frontal sinus itself.

The treatment of a mucocele is difficult and is closely linked to the well-known and controversial problems of radical operative procedures on the frontal sinus. Kaplan, Schwartz, and Metson [22] state that the causes of failure are the following: (1) obstruction of the frontonasal passage by fibrotic or bony closure of the surgically reconstructed passage; (2) remnants of the floor of the frontal sinus that give rise to undrained infected pockets in the frontal sinus, and (3) incomplete ethmoidectomy, especially failure of removal of the orbital extensions of the ethmoid sinuses. These workers used acrylics and tantalum in radical operations on the frontal sinus. They used these materials for the treatment of eight patients with mucocele of the frontoethmoid sinuses and have been encouraged sufficiently to be of the opinion that use of these materials and methods makes possible a better prognosis than was previously experienced.

Simonton and Medwick [23] record two cases of an epidermoid-like lesion of the frontal bone that simulated mucocele. In both of these cases, erosion of the roof of the orbit and displacement of the orbital contents were present. Cystic lesions not connected with the frontal sinus were also present. One case probably represents

21. Wigh, R.: Mucoceles of the Fronto-Ethmoidal Sinuses: Analysis of Roentgen Criteria: Relation of Frontal Bone Mucoceles to Ethmoidal Sinuses, Radiology **54**:579-590 (April) 1950.

22. Kaplan, S.; Schwartz, A., and Metson, B. F.: Mucocele of the Frontal and Ethmoid Sinuses: Evaluation of the Use of Acrylics and Tantalum in the Surgical Treatment, Arch. Otolaryng. **51**:172-187 (Feb.) 1950.

23. Simonton, K. M., and Medwick, J. X.: Epidermoid-like Lesions of the Frontal Bone Simulating Mucocele: Report of 2 Cases, Tr. Am. Laryng. Rhin. & Otol. Soc. **52**:131-140, 1948.

an example of true cholesteatoma occurring within the frontal bone. In the second case, a specimen of tissue could not be accurately classified histopathologically, and the exact nature of the lesion in this case is unknown.

Thacker [24] presents an excellent discussion of epidermoid tumors and so-called primary cholesteatomas of the skull, paranasal sinuses, and orbit. The so-called primary cholesteatomas are actually epidermoid tumors with a high content of cholesterol. Extradural epidermoid neoplasms involving the frontal bone, sinus, or orbit are rather firm slow-growing tumors that produce no symptoms. Persons with this growth seek medical advice chiefly because of the cosmetic deformity. A characteristic round or ovoid defect with smooth borders may be seen in roentgenograms of the skull. As such growths become larger, the greater is the bony destruction and the more difficult is their complete removal.

Handousa [25] records a case of primary carcinoma of the frontal sinus in which surgical and x-ray therapy was apparently successful.

Hallberg and Begley [26] present the arguments concerning the cause of osteoma. The origin of osteomas has been said to be (1) embryologic, (2) traumatic, (3) infectious, and (4) miscellaneous. In the series of 51 cases reported by Hallberg and Begley, the osteomas occurred in 36 males and 15 females. When signs and symptoms were present, their average duration when the patient was first examined was three years eight months. Surgical removal was employed in 29 cases. The osteomas originated in the frontal sinus in 40 cases, in the ethmoid sinus in 9 cases, and in the maxillary sinus in 2 cases. In no case did the osteoma originate in the sphenoid sinus. Of the 40 cases of osteoma of the frontal sinus, in only 19 was an operation performed. The following unusual conditions were found at operation in 17 of these cases: retained pus or granulation tissue, eight cases; retained mucus, four cases; fistulas in the eyebrows, two cases; pyocele, one case; brain abscess, one case; pneumoencephalocele, one case. Hallberg and Begley state that, whenever possible, the frontal duct should be left intact. No silent osteomas occurred in the nine cases of osteoma of the ethmoid sinuses. In these 51 cases, only two instances of osteoma of the maxillary sinus were noted. This series did not include 23 cases of osteoma or osteofibroma of the maxilla.

Vadala and Somers [27] and King [28] record cases of osteoma of the frontal sinus and give their experience in the treatment of this tumor.

Fitz-Hugh, Moon, and Lupton [29] state that cytologic study of antral washings should be recognized as a useful aid in the diagnosis of carcinoma of this region.

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24. Thacker, E. A.: Epidermoid Tumors of the Frontal Bone, Sinus and Orbit, Arch. Otolaryng. **51**:400-413 (March) 1950.

25. Handousa, A. B. S.: Primary Malignant Disease of the Frontal Sinus, J. Laryng. & Otol. **64**:249-251 (May) 1950.

26. Hallberg, O. E., and Begley, J. W., Jr.; Origin and Treatment of Osteomas of the Paranasal Sinuses, Arch. Otolaryng. **51**:750-760 (May) 1950.

27. Vadala, A. J., and Somers, K.: Osteoma of the Frontal Sinus, Arch. Otolaryng. **50**:618-633 (Nov.) 1949.

28. King, N. E.: Osteoma of the Frontal Sinus: Report of 5 Cases, Arch. Otolaryng. **51**:316-324 (March) 1950.

29. Fitz-Hugh, G. S.; Moon, C. N., Jr., and Lupton, C. H.: Cytological Smear Technique in the Diagnosis of Carcinoma of the Maxillary Sinus: Preliminary Report, Laryngoscope **60**:376-387 (April) 1950.

Of 72 consecutive cases of unilateral antral disease, six cases of carcinoma have been recognized by the application of the Papanicolaou technique to antral washings. Unfortunately, in all six of these cases advanced carcinoma was present that could have been recognized readily by other means of diagnosis.

Bordley and Longmire[30] present an operative procedure whereby maximal direct exposure of the intranasal spaces and the surrounding nasal sinuses may be obtained, with minimal subsequent facial scarring and disfigurement. The operation is indicated in only a few carefully selected cases in which the standard types of intranasal operations would not provide adequate exposure for safe removal of an extensive lesion. The technique is described in detail.

Grossman, Donnelly, and Snitman[31] discuss the symptomatology, pathology, and treatment of carcinoma of the antrum. They emphasize the combination of surgical eradication, electrosurgery, intracavitary radium therapy, and external x-ray therapy. Seelig[32] records nine cases of carcinoma of the antrum and reviews the literature of the period from 1936 to 1945 inclusive.

Capps[33] reviews the literature as it pertains to malignant disease of the paranasal sinuses and presents a good discussion of symptoms, diagnosis, treatment, results, and prognosis. It is his opinion that surgical removal with a scalpel for the treatment of malignant disease of the antrum is a thing of the past. Any surgical procedure should be performed by cutting with surgical diathermy and by the use of electrocoagulation, unless a lateral rhinotomy through unaffected skin is being performed. Resection of the jaw as such is unnecessary. He states that surgical diathermy through a proper approach can eradicate the growth wherever it may extend.

Smith and Eberhard[34] review cases of malignant lesion of the nasal fossa and sinuses studied in the Tumor Clinic of Jefferson Medical College Hospital. It is their opinion that excision of the malignant growth in these regions is practically impossible, because symptoms are rarely produced until the growth has spread beyond the limits of the mucous membrane. Irradiation therapy was used in at least 90% of their cases. The lack of any characteristic symptoms or appearance in the early stages of malignant neoplasms of the nose and sinuses to differentiate them from benign lesions is a common obstacle to early recognition. The physician must consider that any obstructive growth is malignant, and the specimen that is submitted to the pathologist must be from the deep part of the growth and not from innocent papillary tissue that may conceal the malignant neoplasm. Symptoms of slight pain, numbness, or paresthesia in the cheek, eye, upper teeth, or ear must be looked on with suspicion. The current educational campaign for the eradication

30. Bordley, J. E., and Longmire, W. P.: Rhinotomy for Exploration of the Nasal Passages and the Accessory Nasal Sinuses, Ann. Otol. Rhin. & Laryng. **58**:1055-1067 (Dec.) 1949.

31. Grossman, A. A.; Donnelly, W. A., and Snitman, M. F.: Management of Malignancy of Maxillary Sinus, Canad. M. A. J. **62**:576-581 (June) 1950.

32. Seelig, C. A.: Carcinoma of the Antrum: Report of 9 Cases with a 10-Year Survey of Literature, Ann. Otol. Rhin. & Laryng. **58**:168-188 (March) 1949.

33. Capps, F. C. W.: Malignant Disease of the Paranasal Sinuses, Ann. Roy. Coll. Surgeons England **4**:38-47 (Jan.) 1949.

34. Smith, A. T., and Eberhard, T. P.: Malignant Lesions of Nasal Fossae and Sinuses: Diagnosis and Treatment, Pennsylvania M. J. **52**:932-935 (June) 1949.

of cancer should publicize the possibility of tumors in the nose and sinuses, as well as in other regions of the body. Medical students and physicians, as well as the general public, should be made alert to the possibility of cancer in this region.

Schall and Brewer [35] present five cases of transitional cell carcinoma of the paranasal sinuses. X-ray therapy, supplemented when necessary by operation to ensure drainage, together with large doses of antibiotics and chemotherapy, was used as the treatment in these cases. The initial response of these tumors to operation, the use of irradiation, or a combination of both may be most gratifying. Subsequent extension or recurrence, however, often merely confirms the original diagnosis, and, though life has been prolonged, the prognosis is unchanged.

Schoolman and Anderson [36] record six additional cases of malignant melanoma of the nose and sinuses. These were added to the 38 cases already reported in the literature. They have not found the tumor less frequently in Negroes than in white persons. These tumors are affected by irradiation, and malignant melanoma should not be considered radioresistant. Biopsy, cautery, and diathermy apparently stimulate metastasis. Wide excision with the scalpel or the use of irradiation appears to be the method of choice for treatment.

Zelle [37] reports the case of a 50-year-old man with carcinoma of the left ethmoid sinus that had metastasized widely. Carcinomas of the ethmoid sinus metastasize early, and usually it is difficult to establish the site of origin of the tumor because of the local extension.

Harkins [38] reports a case of neurinoma of the ethmoid labyrinth and corresponding nasal cavity. Ten other cases of neurinoma of the nasal cavity and sinuses are recorded in the literature. Harkins removed the tumor through an external approach after preoperative irradiation. Bleeding was a prominent symptom.

Smith, Latella, and Schnee [39] report a case of angiofibrosarcoma involving the frontal and ethmoid sinuses that was complicated by osteomyelitis of the frontal bone with formation of an epidural abscess. The occurrence of this type of tumor in the sinuses is extremely rare. No evidence of recurrence in this case was noted four years after treatment by means of radical operation, administration of sulfadiazine and penicillin, and x-ray therapy.

Williams [40] reviews the literature and presents a case of fatal granulomatous ulceration involving the facial tissues in the midline. He speculates about the etiology and suggests that this disease might be of allergic origin and might possibly be treated by administration of hormones of the adrenal cortex.

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35. Schall, L. A., and Brewer, D. W.: Transitional Cell Carcinoma of the Paranasal Sinuses, Ann. Otol. Rhin. & Laryng. **58**:381-393 (June) 1949.

36. Schoolman, J. G., and Anderson, H. W.: Malignant Melanoma of the Nose and Sinuses, Ann. Otol. Rhin. & Laryng. **59**:124-140 (March) 1950.

37. Zelle, K.: Primary Carcinoma of the Ethmoid Sinus, Illinois M. J. **96**:142-145 (Aug.) 1949.

38. Harkins, W. B.: Neurinoma of the Ethmoidal Sinuses, Ann. Otol. Rhin. & Laryng. **58**:498-506 (June) 1949.

39. Smith, M. T.; Latella, P. D., and Schnee, I. M.: Angio-Fibrosarcoma of the Ethmoid and Frontal Sinuses Complicated by Osteomyelitis of the Frontal Bone and Epidural Abscess, Ann. Otol. Rhin. & Laryng. **59**:650-656 (Sept.) 1950.

40. Williams, H. L.: Lethal Granulomatous Ulceration Involving the Midline Facial Tissues, Ann. Otol. Rhin. & Laryng. **58**:1013-1054 (Dec.) 1949.

TUMORS OF THE NASOPHARYNX

Wilkerson and Cayce [41] present an instance of angioma of the nasopharynx and lateral band in which the lesion was successfully excised. This type of tumor rarely occurs on the lateral pharyngeal fold.

Figi and Davis [42] present results of treatment in 51 cases of nasopharyngeal fibroma encountered in the Mayo Clinic during the 10-year period from Jan. 1, 1940, to Dec. 31, 1949. Observations and comments made by them concerning lesions of this type are based on an over-all experience with 114 cases seen at the Mayo Clinic from 1910 to 1949 inclusive. The most satisfactory treatment for nasopharyngeal fibroma is a combination of electrocoagulation and interstitial irradiation. These measures may be used through the nares and transorally through the nasopharynx, but they are more safely and effectively applied through a transantral approach, with or without preliminary ligation of the external carotid artery.

Figi has never observed the complete spontaneous disappearance of these fibromas. With proper treatment, a high percentage of nasopharyngeal fibromas can be completely eradicated or reduced to a small inactive remnant. In fact, by means of electrocoagulation and interstitial irradiation applied transantrally, complete removal often can be accomplished in a single operation. Diehl [43] reports a case of nasopharyngeal fibroma occurring in a woman, 52 years of age.

The results of cytologic studies for diagnosis of malignant lesions of the nasopharynx by the smear technique are excellent, according to Morrison, Hopp, and Wu.[44] The procedure is no substitute for histopathologic diagnosis from material removed for biopsy, but it is recommended as an adjunct for diagnosis. A smear that fails to reveal malignant cells does not eliminate the possibility of a nonexfoliating lesion. The presence of malignant cells signifies the existence of an exfoliating lesion in the upper part of the respiratory tract. It is, then, mandatory that the origin of the cells be found. To accomplish this, a specimen for biopsy should be removed and the final diagnosis made from the tissue. Thus far, these investigators have not found false positive results from study of these smears.

Simmons and Ariel [45] record a series of 150 consecutive cases of carcinoma of the nasopharynx. The commonest site of origin was the pharyngeal recess, or Rosenmüller's fossa (26 cases, or 17.3%). Intracranial extension was demonstrated in 24% of the cases that were studied at necropsy, and metastasis below the clavicle occurred in 54%. In 83% of the cases there was cervical metastasis on admission, and in only 13.3% was there failure to demonstrate cervical metastasis during the course of the disease. Involvement of the cranial nerves was seen in 36.6%. The sixth cranial nerve was affected most frequently. The net five-year survival rate

41. Wilkerson, W. W., Jr., and Cayce, L. F.: Hemangioma of the Lateral Band of the Pharynx and Nasopharynx: Case Report, Laryngoscope **59**:1339-1344 (Dec.) 1949.

42. Figi, F. A., and Davis, R. E.: The Management of Nasopharyngeal Fibromas, Laryngoscope **60**:794-814 (Aug.) 1950.

43. Diehl, K. L.: Fibroma of the Nasopharynx: A Case Report, Ann. Otol. Rhin. & Laryng. **59**:258-261 (March) 1950.

44. Morrison, L. F.; Hopp, E. S., and Wu, R.: Diagnosis of Malignancy of the Nasopharynx: Cytological Studies by the Smear Technic, Ann. Otol. Rhin. & Laryng. **58**:18-32 (March) 1949.

45. Simmons, M. W., and Ariel, I. M.: Carcinoma of the Nasopharynx: Report of 150 Cases, Surg., Gynec. & Obst. **88**:763-775 (June) 1949.

was 9.8%. All the cures occurred in cases in which cervical metastasis had developed. No cures were obtained in cases in which there was intracranial extension.

Wanamaker [46] states that the technique of x-ray therapy in cases of malignant tumor of the nasopharynx is less important than the matter of diagnosis before the disease has reached a hopeless stage. If the diagnosis is made before the tumor has transgressed the boundaries of the nasopharynx by infiltration or before lymphatic metastasis has spread beyond the neck, the prognosis in these cases is not hopeless.

Rosenberger [47] found that the incidence of neoplasms of the nasopharynx in his hospital was 1 in 10,000 cases on admission. Black [48] surveys the tumors that may occur in the nasopharynx and reviews their symptoms and signs.

Grotts [49] records a case of transitional cell carcinoma of the nasopharynx in a 2-year-old child. He states that next to retinal glioma the commonest location of malignant lesions of the head and neck in children is in the region of the nasopharynx, tonsil, and soft palate. In any case in which there is persistent asymmetrical cervical adenopathy, the presence of a tumor should be considered and adequate search for the primary lesion in the upper part of the respiratory tract should be made. Suspicious-appearing masses in the nasopharynx, with or without symptoms, earache, or persistent foul drainage, require prompt biopsy because they may be malignant.

Owens [50] records two cases of tumor of the upper part of the respiratory tract which was composed of salivary gland tissue. A comprehensive review of the literature of the past 20 years reveals 1,138 reported cases of this type. The histologic classification and histopathology of minor tumors of the salivary glands are discussed.

Diehl [51] and Handousa Bey,[52] respectively, record cases of adenocarcinoma and chordoma of the nasopharynx. According to Handousa Bey, chordomas are met within the domain of the rhinolaryngologist much more than anywhere else.

Mekie and Ransome [53] state that the incidence of malignant tumors of the nasopharynx among the Chinese is exceptionally high. The authors resided in Singapore, where the population is predominantly Chinese. Tumors of the nasopharynx ranked third in frequency among neoplasms in the citizens of Singapore. Mekie and Ransome performed bilateral prefrontal leukotomy in four cases of advanced carcinoma of the nasopharynx in an attempt to relieve the distressing

46. Wanamaker, F.: Malignancies of the Nasopharynx, Tr. Am. Laryng. Rhin. & Otol. Soc. **52**:326-334, 1948.

47. Rosenberger, H. C.: Tumors of the Nasopharynx, Ohio M. J. **45**:878-882 (Sept.) 1949.

48. Black, J. I. M.: Tumours of the Naso-Pharynx, M. Press **221**:524-527 (June 1) 1949.

49. Grotts, B. F.: Transitional Cell Carcinoma of the Nasopharynx in a Child, Laryngoscope **59**:1355-1360 (Dec.) 1949.

50. Owens, H.: Minor Salivary Gland Tumors in Respiratory Tract and Ear: Review of the Literature and Report of 2 Cases, Laryngoscope **59**:960-983 (Sept.) 1949.

51. Diehl, K. L.: Salivary Adenocarcinoma of the Nasopharynx: Report of a Case, Arch. Otolaryng. **49**:275-279 (March) 1949.

52. Handousa Bey, A. S.: A Case of Nasopharyngeal Chordoma, J. Laryng. & Otol. **63**:31-33 (Jan.) 1949.

53. Mekie, E. C., and Ransome, G.: Nasopharyngeal Tumors: The Place of Leucotomy in the Terminal Stages of the Disease, Brit. J. Surg. **37**:344-346 (Jan.) 1950.

symptoms that occur in the later stages of this disease. The authors are of the opinion that prefrontal leukotomy provides the most valuable method of amelioration that they have encountered.

Friedberg [54] states that certain intracranial tumors involving the region of the sella turcica are known to invade the sphenoid sinus, the nasopharynx, and the nasal passages by direct extension. The commonest of these tumors are pituitary adenoma and chordoma.

Kawaichi [55] records a case of lymphoepithelioma of the nasopharynx that had metastasized to both testes and both epididymides.

TUMORS OF THE LARYNX AND TRACHEA

Clerf, Putney, and O'Keefe [56] report a series of 369 cases of cancer of the larynx in which operation had been performed five years or more previously, together with an additional 264 cases in which operation had been performed within the past five years. In 286 cases, the primary operation was thyrotomy, and removal of the tumor while laryngectomy was performed was the procedure in 343 cases. In only four cases was there treatment by endolaryngeal measures. Clerf and associates are of the opinion that more lives are saved by surgical treatment than by irradiation therapy for carcinoma of the larynx. Subglottic carcinoma metastasizes early to the regional lymph nodes, and in all questionable cases a cervical dissection should be part of the primary operation. These authors noted a rate of cure of 73.5% when thyrotomy and removal of the tumor were done. Their study does not support the thesis that laryngectomy still can be resorted to if carcinoma recurs after thyrotomy or irradiation therapy. They noted a rate of cure of 58.7% when laryngectomy was done. Since 1942 Clerf and associates have treated patients with metastasis to the cervical lymph nodes by a one-stage procedure consisting of block dissection of the neck and laryngectomy. When there has been a question regarding the presence of metastasis, they have done a prophylactic block dissection and laryngectomy at the same time. The postoperative mortality associated with the combined operation is no greater than that with laryngectomy alone.

Orton [57] states that during the past 50 years real progress has been made in the surgical treatment of malignant disease of the laryngopharynx. Depending on the site of the lesion, at the present time thyrotomy and excision of the tumor can cure 85 to 95% of the patients with carcinoma of the larynx, and total laryngectomy can cure 60 to 90% of these patients. Surgical treatment selected for a patient should be governed by the type of lesion, the extent of growth, and the location. Emotions, economy, or conservatism should not be considered. Conservative methods are unsafe in the treatment of cancer of the laryngopharynx. Diagnosis should be made early. Orton found that in 34% of the 168 cases of cancer of the laryngopharynx that he studied the lesions were inoperable when the patient was first examined

54. Friedberg, S. A.: Intranasal Extension of Pituitary Tumors, Arch. Otolaryng. **49**:103-104 (Jan.) 1949.

55. Kawaichi, G. K.: Bilateral Lympho-Epithelioma of the Testicle and Epididymis, Metastatic from the Nasopharynx, J. Urol. **61**:1073-1077 (June) 1949.

56. Clerf, L. H.; Putney, F. J., and O'Keefe, J. J.: Carcinoma of the Larynx, Tr. Am. Laryng. Rhin. & Otol. Soc. **52**:482-491, 1948.

57. Orton, H. B.: Management of Carcinoma of the Larynx, Laryngoscope **59**:315-334 (April) 1949.

and that 21% of the patients required tracheotomy on the first visit. He states that surgical procedures hold an important place in the battle against extrinsic cancer of the larynx and pharynx.

Cody [58] reports that the present indications for laryngofissure are satisfactory if preservation of a useful voice is considered to be more important than saving of a life, but if saving of a life is more important, a revision of the indications is needed. Irradiation therapy produces a lower survival rate but preserves a much better voice than does operation. Cody states that routine block dissection is indicated when laryngectomy is done, because in approximately 30% of the cases there is extensive metastasis.

Cutler [59] reports a five-year survival rate of 37% in a series of 156 consecutive cases of laryngeal cancer in which radiotherapy was used. According to Cutler, more than half of the lesions were inoperable. In 48 cases in which the lesions were too advanced for laryngofissure and in which the only surgical alternative was total laryngectomy, the five-year survival rate was 57%. In the cases in which the lesions were deemed inoperable, the five-year survival rate was 17%. Cutler states that the most important contribution of radiotherapy to laryngeal cancer relates to the group of lesions that are beyond the scope of laryngofissure and for which total laryngectomy is the only surgical alternative. When such lesions are not yet completely fixed by malignant infiltration, they are ideally suited for radiotherapy, and curability by such treatment is at least equal to that by total laryngectomy.

Cummings [60] prefers operation to x-ray therapy in the treatment of cancer of the larynx. X-ray therapy may cause distressing perichondritis of the laryngeal cartilages and, however successful, usually leaves in its wake a dry uncomfortable throat and a harsh brassy voice.

Cunning [61] states that current methods of x-ray therapy for the treatment of carcinoma of the larynx stem largely from Coutard's protracted fractional-dose technique. Successful treatment requires about six weeks, and the patients are treated daily. Administration of 6,000 to 8,000 r usually is required to produce a cure of a squamous cell epithelioma of the larynx. Growths that originate in the pyriform sinus should be treated by laryngectomy at once, because x-ray therapy alone has been practically useless in the treatment of this type of lesion. Cunning states that it is a simple matter to remove the larynx after x-ray therapy.

Low-Beer [62] is of the opinion that irradiation therapy is the treatment of choice of early carcinoma that is limited to the vocal cord. The restriction of radiotherapy to advanced cases, postoperative recurrences, or palliation in hopeless cases is not warranted in the light of modern results. He states that repetition of a course of irradiation therapy should not be done after the first course of such therapy has failed.

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58. Cody, C. C., Jr.: Treatment of Carcinoma of the Larynx: A Statistical Study of Results, Laryngoscope **59**:621-638 (June) 1949.

59. Cutler, M.: Radiotherapy of Early Cancer of the Larynx: 5 Year Results in 156 Cases, J. A. M. A. **142**:957-962 (April 1) 1950.

60. Cummings, G. O.: Malignant Disease of the Larynx, J. Maine M. A. **40**:204-207 (Aug.) 1949.

61. Cunning, D. S.: Choice of Treatment in Cancer of the Larynx: Year 1949, Ann. Otol. Rhin. & Laryng. **59**:467-473 (June) 1950.

62. Low-Beer, B. V. A.: Radiation Therapy of Cancer of the Larynx, Laryngoscope **60**:696-717 (July) 1950.

Schall [63] emphasizes the following points in connection with radiation therapy for the treatment of carcinoma of the larynx: (1) radiation therapy is not efficacious in hopeless cases; (2) regression of the lesion does not constitute a cure, and (3) the trial period of radiation is a fallacy.

Figi [64] reports three cases in which extensive malignant tumors of the larynx were removed by hemilaryngectomy followed by immediate skin grafting for repair. The lesions were of such an extent that total laryngectomy would have been indicated had not skin grafting been carried out. The period after removal of the malignant lesions from the patients has been too brief to warrant a statement concerning control of the disease. However, the present progress of the patients justifies further trial of the procedure.

Goodyear [65] states that if one side of the larynx is free from any visible evidence of carcinoma, even though the arytenoid cartilage on the opposite side is fixed, a hemilaryngectomy can be safely performed. After the hemilaryngectomy, a solid acrylic tube is placed in the larynx. This tube must be retained for a sufficient length of time to permit the glottis to become lined with mucous membrane. He prefers to wait 10 to 12 weeks before the tracheotomy tube and the acrylic obturator are removed.

Farrior [66] reports that laryngectomized patients usually are happy and rapidly adjust to the inconveniences of their malady. He points to the fact that 49 deaths from cancer of the larynx were reported in Florida in 1947, and that 195 such deaths have been reported in the last seven years. In his opinion, these figures are an indication of grave shortcomings in the clinical detection and treatment of cancer. It was once hoped that fractionated radiation therapy would cure intrinsic cancer of the larynx and that it would supplant completely operative procedures in the treatment of this disease. Such early hopes have not been sustained by the experience of the past 20 years.

Hoover [67] states that when a carcinoma of small size is present on and apparently confined to the epiglottis, removal of the lesion on the epiglottis is indicated, regardless of its grade of malignancy. It has been Hoover's experience that complete removal of the epiglottis, including the aryepiglottic fold, the lateral pharyngoepiglottic fold, and even a portion of the false vocal cords, can be carried out without serious disturbance in the function of the larynx. He prefers the method of exposure that utilizes a transhyoid pharyngotomy. He reports five cases in which operation has been performed since October, 1945.

Gordon [68] describes a case of keratosis of the larynx. He states that this is not a common disease. Its etiology is unknown, and it is impossible, either clinically or

63. Schall, L. A.: Cancer of the Larynx, Arch. Otolaryng. **49**:120 (Jan.) 1949.

64. Figi, F. A.: Removal of Carcinoma of th: Larynx with Immediate Skin Graft for Repair, Ann. Otol. Rhin. & Laryng. **59**:474-486 (June) 1950.

65. Goodyear, H. M.: Hemilaryngectomy: Method of Maintaining a Satisfactory Airway and Voice, Ann. Otol. Rhin. & Laryng. **58**:581-585 (June) 1949.

66. Farrior, J. B.: Laryngofissure and Laryngectomy in Treatment of Intrinsic Carcinoma of the Larynx, J. Florida M. A. **35**:619-622 (April) 1949.

67. Hoover, W. B.: Carcinoma of the Epiglottis Treated by Surgical Excision with Operative Technic, S. Clin. North America **29**:679-689 (June) 1949.

68. Gordon, G. R.: Keratosis of the Larynx: Report of a Case with Underlying Carcinoma in Situ, Laryngoscope **60**:1201-1209 (Dec.) 1950.

histologically, to predetermine whether any lesion will become malignant. Any question, or doubt, as to the presence of malignant changes warrants removal of the lesion by laryngofissure.

Brunner [69] states that superficial carcinoma of the larynx (carcinoma in situ) may be actually malignant microscopically, but it is not a genuine carcinoma from the therapeutic point of view. Brunner does not think that laryngofissure or laryngectomy is indicated for the treatment of carcinoma in situ of the larynx. Such a carcinoma may be removed by the endolaryngeal route if it forms a localized tumor, and further steps may be taken later if this procedure does not prove to be effective.

Walsh and Beamer [70] report two cases of epidermoid carcinoma of the larynx in children 12 and 13 years of age, respectively. Both children had frequent and rapid recurrences of papillomas following surgical removal. They both had been exposed to repeated irradiation of the larynx approximately eight years before the appearance of the epidermoid carcinoma.

Holinger, Johnston, and Anison [71] state that the specific cause of papilloma of the larynx is unknown. The likeliest agent appears to be a filtrable virus, with a hormonal factor influencing the course of the disease. The age of onset of papilloma varies from infancy to advanced adulthood. In their entire series, a malignant degeneration of the papilloma did not occur. Removal by forceps was the most frequently used treatment in this series. In 19 of 109 cases of papilloma, tracheotomy was required. In 16 of these 19 cases, the patients were less than 16 years of age. A preliminary report was made of the use of aureomycin after removal of the papillomas by forceps. The results were encouraging, but the onset of treatment was too recent to allow final conclusions to be drawn.

Miller [72] reports the occurrence of a fibrosarcoma of the larynx in a 7-year-old boy. Two years and nine months after total laryngectomy, the patient was clinically free of disease.

Link [73] reports two cases of cartilaginous tumor of the larynx. One was a chondroma; the other, a chondrosarcoma. The only treatment for these neoplasms is surgical excision. It may be necessary in some cases to do a total laryngectomy.

Fisher and Odess [74] review the accumulated literature on neurofibroma of the larynx and add two more such cases to the record. Holinger and Cohen [75] also report a case of neurofibroma of the larynx.

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69. Brunner, H.: Superficial Epidermoid Carcinoma of the Larynx, Arch. Otolaryng. **51**:49-64 (Jan.) 1950.

70. Walsh, T. E., and Beamer, P. R.: Epidermoid Carcinoma of the Larynx Occurring in 2 Children with Papilloma of the Larynx, Laryngoscope **60**:1110-1124 (Nov.) 1950.

71. Holinger, P. H.; Johnston, K. C., and Anison, G. C.: Papilloma of the Larynx: A Review of 109 Cases with a Preliminary Report of Aureomycin Therapy, Ann. Otol. Rhin. & Laryng. **59**:547-564 (June) 1950.

72. Miller, D.: Fibrosarcoma of the Larynx: Report of a Case in a Child, Ann. Otol. Rhin. & Laryng. **59**:246-253 (March) 1950.

73. Link, M. R.: Chondroma and Chondrosarcoma of the Larynx, Ann. Otol. Rhin. & Laryng. **58**:70-85 (March) 1949.

74. Fisher, G. E., and Odess, J. S.: Solitary Neurofibroma of the Larynx (Report of Two Cases), Laryngoscope **59**:1345-1349 (Dec.) 1949.

75. Holinger, P. H., and Cohen, L. L.: Neurofibromatoses (Von Recklinghausen's Disease) with Involvement of the Larynx: Report of a Case, Laryngoscope **60**:193-196 (Feb.) 1950.

Som and Peimer [76] report a case of multiple cysts of the larynx with oncocytes (oxyphilic granular cells). These cysts originate in the ventricle of the larynx and infiltrate the soft structures of the larynx. The surgical specimen obtained by laryngofissure proved to be an oncocytic cystadenoma. These tumors have been found in the tongue, pharynx, uvula, esophagus, salivary glands, pituitary gland, liver, pancreas, testes, uterine tubes, nasal mucosa, trachea, bronchi, and larynx. They occur only in adults. They rarely are seen before the age of 50 years and quite regularly occur at the age of 70 years and more. It is possible that the oncocyte may be the stem cell of bronchial adenoma.

Kreissl, Muirhead, and Darrough [77] report five additional cases of primary nodular idiopathic deposits of amyloid in the larynx. Primary amyloidosis may be local or systemic. The exact relationship between these two forms is not established at present.

Halliday and Bettington [78] describe a solitary tumor made up of amyloid in the larynx. They point out that amyloid sometimes occurs in small tumors of connective tissue in the larynx.

Woolner and McDonald [79] studied the identification of malignant cells in sputum or bronchial secretions to evaluate the technique of examining smears of this material as a routine procedure in the diagnosis of bronchogenic carcinoma. They studied 150 cases in which cells interpreted as malignant were found in the smears. In three cases, the diagnosis of carcinoma made on the basis of smears was proved to be false. This technique provided the only preoperative microscopic evidence of malignancy in 43% of a total of 58 cases in which surgical exploration was done. The presence of malignant cells in the smears provided the only microscopic evidence of carcinoma in 9 of 24 cases (37%) of bronchogenic carcinoma in which the lesion could be removed.

Watson and associates [80] state that if the thoracic surgeon is to obtain a cure in more patients with bronchogenic carcinoma, he must have more patients with early carcinoma referred to him. To obtain early cases, it is necessary for the internist to view with suspicion every patient with atypical pulmonary disease. It is their opinion that every patient with recurring virus pneumonia or unresolved pneumonia should have a bronchoscopic examination and complete cytologic studies done.

Clerf and Herbut [81] use saline solution in sufficient quantity to secure bronchial washings at the time of bronchoscopic examination. This material is then studied by the Papanicolaou technique. This method of diagnosis allows recognition of cases

76. Som, M. L., and Peimer, R.: Oncocytic Cystadenoma of the Larynx, Ann. Otol. Rhin. & Laryng. **58**:234-242 (March) 1949.

77. Kreissl, L. J.; Muirhead, E. E., and Darrough, L. E.: Primary Amyloid Deposits in the Larynx, Arch. Otolaryng. **50**:309-318 (Sept.) 1949.

78. Halliday, G. C., and Bettington, R. H.: Amyloid "Tumour" of the Larynx Requiring Laryngofissure, M. J. Australia **1**:100-101 (Jan. 22) 1949.

79. Woolner, L. B., and McDonald, J. R.: Carcinoma Cells in Sputum and Bronchial Secretions: A Study of 150 Consecutive Cases in Which Results Were Positive, Surg., Gynec. & Obst. **88**:273-290 (March) 1949.

80. Watson, W. L.; Cromwell, H.; Craver, L., and Papanicolaou, G. N.: Cytology of Bronchial Secretions: Its Role in the Diagnosis of Cancer, J. Thoracic Surg. **18**:113-123 (Feb.) 1949.

81. Clerf, L. H., and Herbut, P.: The Role of Bronchoscopy in Diagnosis and Treatment, New York J. Med. **49**:907-909 (April 15) 1949.

of carcinoma in which the lesion is beyond the range of vision of the bronchologist and in which bronchoscopy reveals nothing abnormal. The cytologic method of diagnosis has allowed early surgical extirpation of lesions that have their origin in the periphery of the lung. It is these lesions that are most amenable to surgical treatment. The cytologic examination of bronchoscopically removed secretions is not to be confused with studies of sputum. It is the opinion of Clerf and Herbut that when more frequent x-ray studies of the thorax are made and when all patients with questionable shadows in the pulmonary fields are examined bronchoscopically, so that secretions may be secured for cytologic examination, the diagnosis of bronchogenic carcinoma will be made earlier and the prognosis of bronchogenic carcinoma will become more hopeful.

Pantridge [82] records two cases of primary carcinoma of the trachea. The tumors in both cases arose from the upper third of the trachea. A brief review of the literature indicates the infrequent occurrence of primary tracheal carcinoma.

According to Effler,[83] the earliest description of adenoma of the bronchus was recorded by Mueller, in 1882. Adenoma of the bronchus is usually found in the primary divisions of the tracheobronchial tree. The majority of these tumors occur in patients between the third and fifth decades, and they most commonly are seen in women. The most widely accepted current method of treatment is surgical extirpation of the tumor. This may be accomplished by lobectomy or pneumonectomy. The rate of cure is considerably more than 90%. A few of these tumors have been known to cause distant metastasis, although this is not found, as a rule.

According to McCart,[84] only three cases of tracheal adenoma have been recorded. He reports the fourth case. He states that these tumors should be considered locally malignant because of their ability to infiltrate in a limited way. It is his opinion that tracheal adenoma should be treated by external surgical removal.

Sharp [85] presents the case of a 5-month-old infant with a history of intermittent dyspnea and stridor. A hemangioma of the upper third of the trachea was excised successfully.

Gerrie and Gauld [86] describe two unusual cases in which stridor was caused, respectively, by a chondroma of the larynx and by an adenoma of the upper part of the trachea.

TUMORS OF THE EAR AND MASTOID

Sylvén and Hamberger [87] report 36 cases of malignant melanoma originating in the skin of the auricular region, including the external auditory meatus and the preauricular skin. They make a clinical classification of these lesions as follows:

82. Pantridge, J. F.: Primary Carcinoma of the Trachea, Brit. J. Surg. **37**:48-49 (July) 1949.

83. Effler, D. B.: Bronchial Adenoma, Cleveland Clin. Quart. **16**:12-16 (Jan.) 1949.

84. McCart, H.: Adenoma of the Trachea, Ann. Otol. Rhin. & Laryng. **58**:1217-1224 (Dec.) 1949.

85. Sharp, H. S.: Hemangioma of the Trachea in an Infant: Successful Removal, J. Laryng. & Otol. **63**:413-414 (July) 1949.

86. Gerrie, J., and Gauld, W. R.: Two Unusual Cases of Stridor, J. Laryng. & Otol. **63**:457-461 (Aug.) 1949.

87. Sylvén, B., and Hamberger, C. A.: Malignant Melanoma of the External Ear: Report of 36 Cases Treated Between 1928 and 1944, Ann. Otol. Rhin. & Laryng. **59**:631-647 (Sept.) 1950.

Stage I. Localized melanoma is confined to the skin. Local recurrences and nearby deposits of tumor in the cutaneous lymph vessels are included.

Stage II. Palpable enlargement of the regional lymph nodes is present. Metastasis is confined to one group of lymph nodes.

Stage III. Metastasis involves two or more groups of lymph nodes, or distant metastasis is present.

Conservative surgical methods, characterized by limited excision of the primary melanoma and combined treatment of the lymph nodes (radiotherapy and operation), resulted in a five-year survival rate of 52% in cases in which the lesions were classed in Stage I. The over-all five-year survival rate was 32%. Sylvén and Hamberger suggest that more radical and earlier surgical intervention might prevent a number of local recurrences and cutaneous satellite tumors. The only patients who were saved by nodal dissection were those in whom the lesion was classified in Stage I and in whom early involvement of a single lymph node was presented. The authors favor electrosurgical excision of the primary tumor. Early hematogenous spread from the primary melanoma, without previous or simultaneous involvement of the lymph nodes, was noted in 3 of 21 cases in which the lesion was considered to be in Stage I. The corresponding incidence in another and larger series was 11.5%.

Towson and Shofstall [88] searched the literature on carcinoma of the ear for views and opinions on occurrence, etiology, symptoms, and treatment of this disease. They are impressed by the fact that delay in diagnosis on the part of the physician occurs too frequently and the patient delays too often before a physician is consulted. Treatment has been too conservative. Physicians should observe chronically discharging ears with particular thoroughness.

House [89] states an exfoliative cytologic diagnostic technique may have definite value in the early detection of cancer in the middle ear. This technique was used in the two cases that he reports, and he concludes that it may also aid in the determination of whether the entire lesion has been removed at operation.

Lattes and Waltner [90] report eight new cases of nonchromaffin paraganglioma of the middle ear. The terms "carotid body-like tumor" and "glomus jugulare tumor" have been used in the medical literature of the past three years to indicate a rare group of primary neoplasms of the middle ear, which are believed to have a common cellular origin and which exhibit well-defined clinical and microscopic characteristics. Some features of these tumors are so characteristic that the presence of these features should at least suggest a correct clinical diagnosis. These characteristics are as follows: (1) a tendency toward extreme bleeding; (2) a subjective sensation of pounding and pulsation in the ear; (3) the progressively expansive type of growth; (4) the possibility of metastasis, and (5) the generally long duration of the symptoms. This long duration frequently is associated with recurrences of the polypoid masses in the external canal following repeated removals.

88. Towson, C. E., and Shofstall, W. H.: Carcinoma of the Ear, Arch. Otolaryng. **51**:724-738 (May) 1950.

89. House, H. P.: Early Detection of Middle Ear Malignancy, Ann. Otol. Rhin. & Laryng. **58**:789-795 (Sept.) 1949.

90. Lattes, R., and Waltner, J. G.: Nonchromaffin Paraganglioma of the Middle Ear (Carotid-Body-like Tumour; Glomus-Jugulare Tumor), Cancer **2**:447-468 (May) 1949.

Presumably these tumors take their origin from a nonchromaffin paraganglionic body, the glomus jugulare, situated in the adventitia of the bulb of the jugular vein, and also from smaller masses of similar paraganglionic cells, which occur in the middle ear and in the tympanic canal, the "paraganglionic tympanicum." It must be assumed that similar tumors have been observed in the past but, because of incorrect interpretation of their histogenesis, have been otherwise classified. It is probable that among such tumors as the "peritheliomas," "adenomas," and "hemangioendotheliomas" described in the literature there are included tumors of this kind.

Miller [91] reports two cases of hemangioendothelioma of the ear and mastoid process, together with a review of the pertinent literature.

Karatay [92] records a case of rhabdomyosarcoma of the middle ear in a 3-year-old child. He could find no similar case in the literature.

Ireland [93] presents the neurologic findings and treatment of tumors of the acoustic nerve. He made a study of 92 cases in which operation was done and in which the presence of acoustic neuroma was proved. Study of these cases tends to disagree with the other studies that show disturbances in hearing in 100% and facial paralysis in 75% of cases. The otologic findings do not follow the prescribed pattern in a certain number of proved cases of tumor of the eighth nerve. The neurosurgeon now realizes that in most cases the otologist can be of great value in the localization of these tumors. The otologist must assume the responsibility for the recognition of additional neurologic symptoms in cases in which there is unilateral nerve deafness that later may prove to be caused by an acoustic neuroma. In doubtful cases, it is necessary to have an accurate estimation of vestibular and auditory functions. These determinations must be done by the use of the most careful hearing tests, including audiometric studies, and by the proper evaluation of vestibular responses.

TUMORS OF THE PHARYNX AND ESOPHAGUS

Schilling, Karr, and Hursh [94] report a case of lingual thyroid gland in which radioactive iodine was used successfully. Data concerning the use of this radioactive isotope and the gross and microscopic effects of this form of treatment on the lingual thyroid gland are recorded.

Shapiro [95] states that cysts of the base of the tongue in infants constitute a medical entity which, although rare, should be considered in any case of stridor. Cystic change in the lingual duct accounts for the appearance of these cysts. Treatment by incision alone gives immediate relief and may be sufficient for permanent cure.

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91. Miller, M. V.: Hemangioma of the Ear and Mastoid Process: Report of 2 Cases, Arch. Otolaryng. **49**:535-546 (May) 1949.

92. Karatay, S.: Rhabdomyosarcoma of the Middle Ear, Arch. Otolaryng. **50**:330-334 (Sept.) 1949.

93. Ireland, P. E.: Otological Findings in Acoustic Nerve Tumors, Ann. Otol. Rhin. & Laryng. **58**:716-727 (Sept.) 1949.

94. Schilling, J. A.; Karr, J. W., and Hursh, J. B.: The Treatment of a Lingual Thyroid with Radioactive Iodine, Surgery **27**:130-138 (Jan.) 1950.

95. Shapiro, M. J.: Cysts on the Base of the Tongue in Infants, Ann. Otol. Rhin. & Laryng. **58**:457-469 (June) 1949.

Baclesse [96] reports the results of x-ray therapy for treatment of cancer of the hypopharynx in 240 cases. The prognosis for cancer of the hypopharynx is poor because tumors occurring in this site are usually of an ulcerating and destructive nature. Complications, such as infection, involvement of the cartilage, and sometimes considerable extension to the surrounding structures, make eradication of these lesions difficult. Baclesse divides the hypopharynx into two anatomic parts: (1) an upper, or membranous, part, including the aryepiglottic fold and the pharyngolaryngeal fold, and (2) a lower, or osteocartilaginous, part, limited laterally by the thyroid lamina and medially by the arytenoid and the cricoid cartilages. Malignant tumors of the upper part can be cured by x-ray therapy when they are proliferative, while tumors of the lower part are much more difficult to treat, being practically incurable by x-ray therapy when they are ulcerating. He attempted to reduce cutaneous reactions by prolonging treatment and by reducing the size of the fields while increasing the total dose. Treatment may be continued from 6 to 12 weeks.

Owen [97] states that it is difficult to choose treatment in cases of carcinoma of the hypopharynx. When an operable lesion is being dealt with, it is easy to take the path of least resistance and refer the patient to the radiotherapist. Irradiation is being tried, with limited success. Owen wonders what constitutes the greater form of misery—that which follows unsuccessful radiotherapy after a decision has been made not to do a radical operation or that which comes when a recurrence appears after performance of a radical pharyngolaryngectomy, particularly when such recurrence appears before the plastic phase of the operation has been completed. He examined the records of 34 cases of women with Plummer-Vinson syndrome who had been examined by him in 1934 and 1935. Postcricoid carcinoma appeared in 5 of the 34 patients. In treating patients with this complication, he performed a one-stage pharyngolaryngectomy and reconstructed the pharynx with a free inlying skin graft. He preferred the large Wookey type of cervical cutaneous flap when operation was done on patients wth large growths that were situated in the postcricoid space and that extended to the upper end of the esophagus.

Klopp and Delaney [98] state that, with the development of endoscopic instruments, the pharynx, hypopharynx, base of the tongue, and upper portions of the esophagus and larynx have become reasonably accessible to exploration under direct vision, without the necessity for a surgical incision. However, some conditions and circumstances exist in which a more adequate exposure is either advantageous or absolutely necessary. A number of anatomic approaches to this problem have been presented, most of which involve the lateral pharyngeal wall. These lateral approaches interrupt at least one important nerve when the opening in the pharynx is of any considerable size. An anterior approach does not destroy any major nerve or vessel and is an easier technical procedure. The central segment of the hyoid

96. Baclesse, F.: Roentgenotherapy in Cancer of Hypopharynx, J. A. M. A. **140**:525-529 (June 11) 1949.

97. Owen, R. D.: The Problem of Hypopharyngeal Carcinoma, Proc. Roy. Soc. Med. **43**: 157-170 (March) 1950.

98. Klopp, C. T., and Delaney, A.: Anterior (Median) Pharyngotomy, Arch. Surg. **60**:1161-1170 (June) 1950.

bone is excised, and the pharynx is entered through a transverse incision. This procedure is a useful diagnostic and therapeutic approach to diseases in the pharyngeal area. Morbidity and complications are minimal. The indications for the procedure are listed: (1) excision of a benign or malignant tumor of the pharyngeal wall; (2) implantation of interstitial radium into a nonresectable lesion of the pharynx, and (3) establishment of an accurate anatomic diagnosis when this cannot be done by means of endoscopy. Illustrative reports of cases are given.

Portmann [99] also discusses a transpharyngeal approach to tumors of the base of the tongue, and Byrnes [100] presents four cases in which postcricoid carcinomas were successfully resected. The latter worker describes a technique of anastomosis of the pharynx and esophagus. He used a graft of fascia lata to restore the continuity of the lumen when a direct anastomosis could not be performed.

Slaughter and de Peyster [101] present the clinical findings and discuss the surgical management of four cases of neurilemmoma originating in the upper cervical distribution of the cranial nerves. Three of the tumors originated from the vagus nerve and one from the hypoglossal nerve.

A clinical diagnosis of such lesions usually can be made when the following indications are present: (1) A bulging firm submucosal tumor presents in the posterolateral pharyngeal wall, causing dysphagia and, later, interference with the airway; (2) pulsation of the tumor is present, caused by medial displacement of the internal carotid artery, and (3) interference with the function of the nerve involved is noted. In two of the cases of tumor of the vagus nerve there was paralysis of the vocal cord on the same side. Slaughter and de Peyster recommend extirpation of these lesions through an external cervical approach.

Kennon [102] records another case of neurinoma of the pharynx.

Brewer [103] removed a benign fibromatous polyp that measured 13.5 cm. in length and 3 cm. in diameter from the hypopharynx of a 55-year-old woman who complained of nausea and a feeling of a moving lump in her throat for two years. The polyp was attached to the posterior wall of the hypopharynx by a broad base near the cricopharyngeal region, and usually it hung down into the esophagus.

Hung [104] records a case of carcinosarcoma of the hypopharynx. The tumor was found to arise by a narrow pedicle from the left posterolateral wall of the hypopharynx. Approximately 200 cases of so-called carcinosarcoma have been recorded in the world's literature. Only two reports of hypopharyngeal carcinosarcoma are included in this list.

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99. Portmann, G.: Surgery at the Base of the Tongue by Transpharyngeal Approach, Arch. Otolaryng. **50**:373-376 (Oct.) 1949.

100. Byrnes, C. K.: Post-Cricoid Cancer, Irish J. M. Sc. Series 6, 236-243 (May) 1950.

101. Slaughter, D. P., and de Peyster, F. A.: Pharyngeal Neurilemmomas of Cranial Nerve Origin: Medial Displacement of the Internal Carotid Artery as a Diagnostic Sign, Arch. Surg. **59**:386-397 (Sept.) 1949.

102. Kennon, W. G., Jr.: Neurinoma Pharynx: Report of a Case, Laryngoscope **60**:388-391 (April) 1950.

103. Brewer, D. W.: Hypopharyngeal Polyp, Arch. Otolaryng. **50**:831-832 (Dec.) 1949.

104. Hung, W. C.: A Case of Pedunculated Carcinosarcoma of the Hypopharynx, Ann. Otol. Rhin. & Laryng. **58**:1100-1108 (Dec.) 1949.

Andersen, McDonald, and Olsen [105] are of the opinion that cytologic examination of secretions from the esophagus and cardia of the stomach for malignant cells is of definite value in the diagnosis of carcinoma.

They collected material by the use of any of several procedures. 1. At the time of esophagoscopy, material was obtained as follows: (*a*) The lesion was touched with a cotton swab, and smears were made from the swab; (*b*) aspirated fluid was centrifuged, and smears were made from the sediment; (*c*) an applicator was pushed through the esophagogastric junction and withdrawn, and smears were made from the swab. 2. After dilation, a cotton applicator was rubbed over the spiral portion of the dilator, and smears were made from the swab. 3. Cotton was wrapped around the tip of a gastric tube, and the tube was passed until it met an obstruction or until 40 cm. of its length had been passed. The tube was then withdrawn, and smears were made from its tip.

The records were studied of 50 consecutive cases in which malignant cells were found in smears of secretions from the esophagus and cardia. In only one case were false positive results obtained.

Crump and Hennig [106] used a retrograde basket curette to obtain specimens for biopsy from certain lesions in the esophagus. This method yielded positive results in 18 of the 20 cases in which it was used, including 10 cases in which biopsy of the esophagus had disclosed nothing abnormal. In this series, esophagoscopic biopsy resulted in the correct diagnosis in 79% of the cases of carcinoma of the esophagus. Failures in diagnosis occur if the lesion cannot be seen directly or if tissue is removed from a region above the upper limit of the tumor.

Kisner,[107] Thompson,[108] and Coleman,[109] in separate papers, discuss the surgical treatment of cancer of the esophagus. Shefts and Fischer,[110] Wylie and Frazell,[111] Brewer,[112] and Nissen [113] present cases in which pharyngogastrostomy or esophagogastrostomy was performed for the treatment of carcinoma of the cervical part of the esophagus.

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105. Andersen, H. A.; McDonald, J. R., and Olsen, A. M.: Cytologic Diagnosis of Carcinoma of the Esophagus and Cardia of the Stomach, Proc. Staff Meet., Mayo Clin. **24**:245-253 (May 11) 1949.

106. Crump, A. B., and Hennig, G. C.: The Diagnosis of Carcinoma of the Esophagus: The Method of Biopsy with the Retrograde Curette, Gastroenterology **13**:153-159 (Aug.) 1949.

107. Kisner, W. H.: Present Status of the Surgical Treatment of Carcinoma of the Esophagus, South. Surgeon **15**:478-488 (July) 1949.

108. Thompson, H. L.: Surgical Treatment of Carcinoma of the Esophagus and Stomach, Arch. Surg. **58**:662-678 (May) 1949.

109. Coleman, F. P.: Treatment of Carcinoma of the Esophagus, Virginia M. Month. **76**:170-173 (April) 1949.

110. Shefts, L. M., and Fischer, A.: Carcinoma of the Cervical Esophagus with One-Stage Total Esophageal Resection and Pharyngogastrostomy, Surgery **25**:849-861 (June) 1949.

111. Wylie, R. H., and Frazell, E. L.: Cervical Esophagogastric Anastomosis Following Subtotal Resection of the Esophagus for Carcinoma, Ann. Surg. **130**:1-8 (July) 1949.

112. Brewer, L. A.: One-Stage Resection of Carcinoma of the Cervical Esophagus with Subpharyngeal Esophagogastrostomy: Report of a Successful Case, Ann. Surg. **130**:9-20 (July) 1949.

113. Nissen, R.: Cervical Esophagogastrostomy Following Resection of Supra-Aortic Carcinoma of the Esophagus, Ann. Surg. **130**:21-30 (July) 1949.

Bricker, Burford, and Eiseman [114] present a case of carcinoma of the upper third of the esophagus in which the lesion was removed by excision of the esophagus from just below the aortic arch to the inferior border of the cricopharyngeus muscle. A tubed pedicle graft from the thoracic wall was used to restore the continuity of the esophagus. They state that this was the first time that a tubed pedicle graft had been used within the mediastinum.

Stout, Humphreys, and Rottenberg [115] record a case of pedunculated carcinosarcoma on the anterior wall in the lower half of the esophagus. Ten other cases in which the neoplasms show a marked resemblance to the lesion in this case have been reported. These lesions had the following characteristics: (1) All were polypoid; (2) nine occurred in men; (3) all patients were 49 years or more of age, and (4) in every case but one, the tumor was in the lower half of the esophagus. Only the sarcomatous elements metastasized.

Clark [116] reports the successful resection of a fibrosarcoma of the upper part of the esophagus. Harrington [117] presents 11 cases of benign or secondarily malignant tumors of the esophagus. Swartz and Arrag [118] report the occurrence of a mucous cyst of the esophagus that caused obstruction in a 64-year-old man.

Goldman and Masters [119] and Hurwitz,[120] in separate papers, discuss leiomyoma of the esophagus. Errors in the diagnosis of this lesion are not uncommon but usually can be avoided by the skillful use of roentgenograms and the esophagoscope.

114. Bricker, E. M.; Burford, T. H., and Eiseman, B.: The Use of Tubed Pedicle Grafts in Carcinoma of the Upper Esophagus, J. Thoracic Surg. **18**:304-313 (June) 1949.

115. Stout, A. P.; Humphreys, G. H., II, and Rottenberg, L. A.: A Case of Carcinosarcoma of the Esophagus, Am. J. Roentgenol. **61**:461-469 (April) 1949.

116. Clark, D. E.: Sarcoma of the Esophagus: Report of Successful Resection of a Fibrosarcoma, Arch. Surg. **59**:348-354 (Aug.) 1949.

117. Harrington, S. W.: Surgical Treatment of Benign and Secondarily Malignant Tumors of the Esophagus, Arch. Surg. **58**:646-661 (May) 1949.

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(To be concluded.)

CORRECTION

In the article by Samuel Rosen, M.D., entitled "Surgery and Neurology of Ménière's Disease," published in the August issue of the A. M. A. ARCHIVES OF OTOLARYNGOLOGY, the table on page 155 should have followed the sentence beginning "The results of stimulation of the intact and central sectioned end of the chorda tympani nerve."

Special Reports

HEARING AIDS ACCEPTED BY THE COUNCIL ON PHYSICAL MEDICINE AND REHABILITATION OF THE AMERICAN MEDICAL ASSOCIATION

AS OF NOV. 1, 1952

Audicon Models 400 & 415
Mfr., National Earphone Co., Inc.
20 Shipman St.
Newark 2, N. J.

Audiotone Model 11
Mfr., Audio Company of America
5305 N. Sixth St.
Phoenix, Ariz.

Audivox Model Super 67
Mfr., Audivox, Inc.—Successor to Western Electric Hearing Aid Division
123 Worcester St.
Boston 18

Aurex Models L & M
Mfr., Aurex Corporation
1117 N. Franklin St.
Chicago 10

Beltone Symphonette Model

Beltone Mono-Pac Model M
Mfr., Beltone Hearing Aid Co.
1450 W. 19th St.
Chicago 8

Cleartone Model 500

Cleartone Model 700

Cleartone Regency Model
Mfr., American Sound Products, Inc.
1303 S. Michigan Ave.
Chicago 5

Dahlberg Model D-1

Dahlberg Junior Model D-2
Mfr., The Dahlberg Company
Golden Valley
Minneapolis 22

Dysonic Model 1
Mfr., Dynamic Hearing Aids, Inc.
149 Church St.
New York 7

Electroear Model C
Mfr., American Earphone Co., Inc.
10 E. 43rd St.
New York 17

Gem Model V-35

Gem Model V-60
Mfr., The Gem Ear Phone Co., Inc.
50 W. 29th St.
New York 1

Goldentone Models 25, 69 & 97
Mfr., Johnston Hearing Aid Mfg. Co.
708 W. 40th St.
Minneapolis 8

Distr., Goldentone Corporation
708 W. 40th St.
Minneapolis 8

Maico UE Atomeer

Maico Quiet Ear Models G & H

Maico Model J
Mfr., The Maico Company, Inc.
21 N. 3rd St.
Minneapolis 1

Mears (Crystal & Magnetic) Aurophone Model 200

1947-Mears Aurophone Model 98
Mfr., Mears Radio Hearing Device Corporation
1 W. 34th St.
New York 1

Micronic Model 303

Micronic Model Mercury

Micronic Star Model
Mfr., Audivox, Inc.—Successor to Western Electric Hearing Aid Division
123 Worcester St.
Boston 18

Microtone Audiomatic T-5

Microtone Classic Model T-9

Microtone Model T-10

Microtone Model T612

Microtone Model 45

Mfr., The Microtone Company
Ford Parkway on the Mississippi
St. Paul 1

National Cub Model (C)

National Model D (Duplex)

National Standard Model (T)

National Star Model (S)

National Ultrathin Model 504

National Vanity Model 506

Mfr., National Hearing Aid Laboratories
106 S. 7th St.
Philadelphia 6

Otarion Model E-4

Otarion Models F-1, F-2 & F-3

Otarion Models G-2 & G-3

Mfr., Otarion, Inc.
4757 N. Ravenswood Ave.
Chicago 40

Paravox Model D Top-Twin-Tone

Paravox Model J (Tiny-Myte)

Paravox Model XTS ('Xtra-Thin)

Paravox Model Y (YM, YC & YC-7) [Veri-Small]

Mfr., Paravox, Inc.
2056 E. 4th St.
Cleveland 15

Radioear Permo-Magnetic (Multipower)

Radioear Permo-Magnetic (Uniphone)

Radioear All-Magnetic Model 55

Radioear Model 62 Starlet

Radioear Model 72

Mfr., E. A. Myers & Sons, Inc.
306 Beverly Rd.
Mount Lebanon
Pittsburgh 16

Distr., Radioear Corporation

Rochester Model R-1

Rochester Model R-2

Mfr., Rochester Acoustical Laboratories, Inc.
117 Fourth St., S. W.
Rochester, Minn.

Silvertone Model J-92

Silvertone Model P-15

Mfr., Johnston Hearing Aid Mfg. Company
708 W. 40th St.
Minneapolis 8

Distr., Sears, Roebuck and Co.
925 S. Homan Ave.
Chicago 7

Solo-Pak Model 99

Mfr., Solo-Pak Electronics Corp.
Linden St.
Reading, Mass.

Sonotone Model 700

Sonotone Model 900

Sonotone Models 910 & 920

Sonotone Model 925

Sonotone Model 940

Sonotone Model 966

Mfr., Sonotone Corporation
Elmsford, N. Y.

Super-Fonic Hearing Aid

Mfr., American Sound Products, Inc.
1303 S. Michigan Ave.
Chicago 5

Televox Model E

Mfr., Televox Mfg. Company
1307 Sansom St.
Philadelphia 7

Telex Model 97

Telex Model 99

Telex Model 200

Telex Model 300-B

Telex Model 400

Telex Model 500

Telex Model 1700

Mfr., Telex, Inc.
Telex Park
St. Paul 1

Tonamic Model 50

Mfr., Tonamic, Inc.
12 Russell St.
Everett 49, Mass.

Tonemaster Model Royal

Tonemaster Cameo Model

Mfr., Tonemaster, Inc.
400 S. Washington St.
Peoria 2, Ill.

Unex Midget Model 95

Unex Midget Model 110

Unex Models 200 & 230

Mfr., Nichols & Clark
Hathorne, Mass.

Vacolite Models J & J-2

Mfr., Vacolite Company
3003 N. Henderson St.
Dallas 6, Texas

Western Electric Models 65 & 66

Mfr., Audivox, Inc.—Successor to Western Electric Hearing Aid Division
123 Worcester St.
Boston 18

Zenith Model 75

Zenith Miniature 75

Zenith Model Royal

Zenith Model Super-Royal

Mfr., Zenith Radio Corporation
5801 W. Dickens Ave.
Chicago 39

(All the accepted hearing devices have vacuum tubes.)

Accepted hearing aids more than five years old have been omitted from this list for brevity

TABLE HEARING AIDS

Ambco Hearing Amplifier (Table Model)

Mfr., A. N. Brooks Company
684 S. Bonnie Brae St.
Los Angeles 5

Aurex Semi-Portable

Mfr., Aurex Corporation
1117 N. Franklin St.
Chicago 10

Precision Table Hearing Aid

Mfr., Precision Hearing Aids
5157 W. Grand Ave.
Chicago 39

Sonotone Professional Table Set Model 50

Mfr., Sonotone Corporation
Elmsford, N. Y.

Abstracts from Current Literature

Ear

FURTHER OBSERVATIONS UPON THE DIAGNOSIS OF DEAFNESS IN YOUNG CHILDREN. M. R. DIX and C. S. HALLPIKE, Brit. M. J. **1**:235 (Feb. 2) 1952.

Dix and Hallpike present still another confirmation of the fact first observed by Urbantschitsch many years ago that nearly all profoundly deaf children have some remnant of hearing which may be used in auricular training for language and speech. These children must be trained in a conditioned response in order to make quantitative hearing tests. The authors use a refinement of the Ewing technique which has already gone through a number of steps in its evolution. The apparatus uses interesting pictures to attract the child's attention. The association with sound is developed, for the child is induced on hearing the sound to press a button which turns on a light illuminating the picture. The sound or sounds are the frequencies of an audiometer and can be controlled as to loudness so as to obtain threshold of pitch hearing. Thus, an audiogram can be obtained.

[The principle is the same as that used by Wishart (Toronto) in his method and is analogous to the recently invented Jack-in-the-box technique. Still other methods are the use of an associated tactile stimulus (Macfarlan) and the galvanic skin response to a small electric shock.]

The authors take great pains to detail the importance of the "set" of the test in order to get concentration and to avoid distraction. In every way the article covers all the items that a novice should know and follow.

In addition to the test itself, there is valuable exposition of the conclusions to be drawn from the findings, particularly in relation to the educational program and the implications as to the psychology of these children.

[It seems unusual to find in this article a statement that "no great difficulties have been encountered in assessing the mental capacities," an observation not before recorded by those most familiar with the deaf child. Aphasias, though rare, are not mentioned as in conflict with conditioned-response testing, nor is profound attention deafness mentioned. Behavior problems and altered psychology, particularly of the "blocking" type, are so commonly the result of childhood deafness that they present a psychological overlay that is often inseparable from mental inferiority. It is strange that these stumbling blocks in the testing of the young deaf child without language are not mentioned.

This same issue of the *British Medical Journal* recognizes the excellence of the article and the importance of its subject in an editorial.]

DOUGLAS MACFARLAN, Philadelphia.

Pharynx

PHARYNGEAL INFECTION COMPLICATED BY EROSION OF THE INTERNAL JUGULAR VEIN. F. G. FOLKEN, Minnesota Med. **34**:877 (Sept.) 1951.

Severe or fatal hemorrhages of pharyngeal infections are the result of infection of the parapharyngeal space. They are the result of breakdown of lymph nodes in the upper retropharyngeal space. Spread from the point of origin may be hematogenous, by lymphatics or by direct extension. In the parapharyngeal space some glands lie along the internal carotid, others along the internal jugular vein. As these infections originate usually from pharyngitis or from tonsillitis, and, as the carotid artery lies closest to the usually affected areas, it is most commonly involved. Infection attacking an artery may result in aneurysm and pseudoaneurysm, with later rupture. When a vein is involved, however, it may be strengthened by thrombosis. If this occurs, it tends to prevent hemorrhage. Symptoms of slight bleeding or of a soft fluctuant swelling with pulsation should be regarded with great respect.

Immediate exploratory incision and ligation are required and are the only safe procedure. One case is reported with autopsy findings.

ROBERT LEWY, Chicago.

Larynx

FISH BONES IN THE ESOPHAGUS. EDITORIAL, J. A. M. A. **149**:576 (June 7) 1952.

It has been stated that fish bones are transparent, so x-ray examination for them is of restricted value. But recent data from 56 hospitalized patients revealed that direct x-ray visualization of the fish bone was possible in 30 of 40 patients in whom a foreign body was later found.

Fish bones whose radiopacity can be expected to be of diagnostic value are bass, codfish, flounder, fluke, gray sole, haddock, halibut, porgie, red snapper, sea bass, smelt, striped bass, and white perch.

The less radiopaque ones include fresh salmon, smoked salmon, and yellow pike, while those either faintly or not at all radiopaque include butterfish, mackerel, pompano, and trout.

GORDON, Philadelphia.

ACUTE LARYNGOTRACHEOBRONCHITIS. F. G. FOLKEN, Minnesota Med. **35**:336 (April) 1952.

Folken reviews the subject of acute laryngotracheobronchitis. In the differential diagnosis laryngeal diphtheria must be ruled out. The treatment consists of the use of moisture, preferably cold humidity, antibiotics, and oxygen. Antihistamine drugs are contraindicated. Atropine and codeine should not be used, since they may increase the viscosity of the sputum. Hydration of the patient is important. If the dyspnea increases in spite of these measures, and if laryngeal obstruction becomes severer, tracheotomy is indicated. The high postoperative mortality can be avoided with adequate postoperative care.

STUSSER, Minneapolis [A. M. A. AM. J. DIS. CHILD.].

OUTPATIENT MANAGEMENT OF PERORAL ENDOSCOPY CASES. MILTON S. LLOYD and MILTON A. JUSTER, New York J. Med. **52**:337 (Feb. 1) 1952.

The basic work for this study was carried out in the Department of Thoracic Surgery and the Bronchoscopy Clinic, French Hospital, New York City. Lloyd and Juster state that bronchoscopy was originally set up for removal of foreign bodies, laboratory diagnosis for specimens from the lungs, and diagnosis and treatment of pulmonary conditions; it is, therefore, a means for physical examination of the lungs. But it has not reached its full capacity because some think it difficult and dangerous and merely helpful in confirmatory diagnosis. Patients are often sent into a hospital unnecessarily. This practice requires beds, general anesthesia, and expense beyond any seeming necessity. An ambulatory plan is here described which requires from 6 to 12 rooms for disrobing, anesthesia, preparation, recovery, and sufficient medical personnel (three specialists and one intern) who must know x-ray interpretation, complete physical examination techniques, and recording and filing of records. Applied psychology seeks a spirit of friendliness, the reduction of fear to a minimum, skillful endoscopic technique, a nurse-supervisor alert to every detail, an instrument nurse who is expert in her duties, and clerical assistance for the maintenance of records. There were 600 consecutive endoscopic examinations, of which only 30 involved "inpatients." The records showed bronchoscopies, 309; esophagoscopies, 111; laryngoscopies, 114; gastroscopies, 30, and bronchograms, 39. "Cocaine hydrochloride is the agent of choice," but not more than 2 cc. of a 10% solution is allowed. It is aimed to touch only the parts to be examined, not the entire pharynx or larynx. Deposit is done by syringe, not by sprays. When 2 cc. of water can be passed into the trachea without cough, the anesthesia is deemed to be sufficient. For laryngoscopy the anesthesia need not extend below the carina. "The gag reflex is a product of the subconscious mind and, consequently, is not susceptible to influence by local anesthesia." Preliminary sedation is obtained by the administration of secobarbital (seconal®), 1.5 grains one hour before examination. It is said to be antagonistic to cocaine, besides having quieting qualities.

For the dorsal recumbent position the shoulders must be in contact with the table, the head must be so manipulated that the cervical and thoracic portions of the trachea are in a straight line, the chin must be extended to avoid too much leverage on the upper teeth, and the "lift" upon the floor of the mouth must be exerted at a right angle to the tracheal axis. Operating

decorum and complete silence are insisted upon for the benefit of the patient's sensorium, and "all manipulations must be carried out objectively, gently and deliberately." A diagram shows the layout at French Hospital for outpatient peroral endoscopy. "A practical saving in the demand for hospital beds and in expense to the patient is shown."

[This is a brief, incisive, and comprehensive description of endoscopy for the ambulant outpatient.]

I. W. VOORHEES, New York.

HEMI-LARYNGECTOMY WITH PLASTIC RECONSTRUCTION. M. AUBRY and J. ROUGET, Ann. oto-laryng. **68**:129 (Feb.-March) 1951.

The procedure described is applicable especially to (1) unilateral involvement of the entire half of the larynx, especially with invasion of the malignant lesion of the cricoarytenoid region, and (2) malignant lesions involving the pyriform sinus and the laryngeal wall and particularly the lower portion of the pyriform sinus.

The operative technique suggested is the rehabilitation of the classical hemilaryngectomy, with the use of an Indian-type cervical flap molded over an intralaryngeal synthetic tube.

The procedure may be resorted to instead of the mutilating laryngectomy or pharyngo-laryngectomy.

VIOLÉ, Los Angeles.

PERACUTE PHLEGMONOUS EDEMATOUS EPIGLOSSITIS. C. GASSER, Schweiz. med. Wchnschr. **82**:379 (April 12) 1952.

The ages of the 25 (26?) patients varied from 15 months to 7½ years. No special tendency to allergy was noted. The children were sent to the hospital with various diagnoses, such as laryngeal diphtheria, pseudocroup (laryngismus stridulus), pharyngeal abscess, and foreign body. Clinically important is a rapidly progressing dyspnea without hoarseness, without the cough of pseudocroup, without exudations in the throat, and without pulmonary involvement. The swollen epiglottis is readily palpable. The prognosis depends upon the early diagnosis, when it may be possible to avoid tracheotomy by energetic antibiotic treatment, with stimulation of circulation. Thus, the mortality could be reduced from 80 to 20%. Occasionally severe complications occur.

AMBERG, Rochester, Minn. [A. M. A. AM. J. DIS. CHILD.].

SURGICAL TREATMENT OF CANCER LARYNGITIS WITH SPECIAL REFERENCE TO THE RESULTS OF LARYNGECTOMY. J. FALBE-HANSEN, Acta oto-laryng. (Supp.) **95**:212 (June) 1950.

Even in those instances and situations in which the highest quality of x-ray therapy is available, laryngectomy remains the specific method of choice in certain types of laryngeal carcinoma. These are the subglottic carcinoma, cancer of the vocal cord with fixation, and cancer invading the cartilage.

Laryngectomy may be successful after one series of x-ray treatments after the treatment method of Coutard. Fable-Hansen considers two series of Coutard treatments a contraindication. With the modern antibiotics the single-stage operation is the method of choice and does not carry too serious an operative mortality. Good function with a new buccoesophageal voice may be anticipated. Intimate collaboration between the radiologist and the surgeon is essential to decide on proper treatment.

ROBERT LEWY, Chicago.

Nose

BILATERAL CONGENITAL CHOANAL ATRESIA IN NEWBORN. HARRY J. COHEN and IRA S. WITCHELL, A. M. A. Am. J. Dis. Child. **83**:328 ((March) 1952.

Cohen and Witchell state that this condition is "rather rare." It was first described by Otto, in 1829, and up to September, 1949, 235 cases had been reported.

A white male infant was delivered at full term after normal gestation. Respirations were rapid and irregular, with a pulse rate of 200 beats or more per minute and cyanosis. A catheter could not be passed for feeding through either nostril, and staining fluid dropped into the nose on each side did not appear in the nasopharynx. On the 17th day there were marked cyanosis

and dyspnea for which a tracheotomy was performed, followed by death in 36 hours. At autopsy congenital bilateral choanal atresia, pneumothorax (left), atelectasis (left), diffuse mucopurulent tracheobronchitis, emphysema and hemorrhage (right), and purulent otitis media (left) were found. The latter was said to be due to stomach "regurgitation of milk through the Eustachian tube" (left). The right tube seems to have been clear. A smear of the aural discharge during life showed Gram-negative bacilli and staphylococci. However, the autopsy report states, "Smear showed pus cells, no organisms"! It is here stated that, "More thorough autopsy examination in cases of asphyxia neonatorum might reveal hitherto undiagnosed cases of choanal atresia. Routine examination to determine patency of the choanae should be performed in all cases of tonsillectomy and adenoidectomy."

The suggestions are good, but the accoucheur might well do the same thing at the birth and thus relieve the ear, nose, and throat specialist of the responsibility.

I. W. VOORHEES, New York.

THE RACIAL INCIDENCE (CHINESE) OF NASOPHARYNGEAL CANCER. HAYES MARTIN and STUART QUAN, Ann. Otol. Rhin. & Laryng. **60**:168 (March) 1951.

Martin and Quan have noted a marked racial predilection to cancer of the nasopharynx in Chinese patients admitted to the Memorial Hospital Clinic in New York City during the 15-year period from 1935 to 1950. There is suggestive evidence that this susceptibility is shared to some extent by all oriental races except the Japanese, in whom there is no statistical evidence of such a tendency so far. An excellent review of the literature on the subject is presented.

Forty-five cases of cancer of the upper respiratory and alimentary tracts were observed in Chinese patients during the 15-year period. Of these, 37 (82.2%) showed cancer of the nasopharynx as compared to an expected incidence of 5.5% based on the over-all (mainly Caucasian) incidence in the Memorial Hospital. The incidence of cancer in anatomic sites other than the nasopharynx appears to be about the same for Chinese patients and other Orientals as for Caucasians.

STEELE, Kansas City, Kan.

TETANUS RESULTING FROM FOREIGN BODY IN THE NOSE. R. B. TUDOR, J. A. M. A. **149**:660 (June 14) 1952.

Tudor reports a case of tetanus resulting from a foreign body in the nose. A 4½-year-old white girl was admitted to the hospital, with all the clinical findings of tetanus. A purulent mass was found well back in the left naris and on removal was found to be a piece of cloth. Intensive therapy consisted of 100,000 units of tetanus antitoxin administered intramuscularly, administration of 2.5% thiopental (pentothal®) sodium solution added to a continuous intravenous drip of 5% glucose solution, and penicillin given intravenously the first week, with full recovery after the 25th hospital day.

Tudor includes a report by Spaeth of a 2½-year-old child who recovered from a mild case of tetanus due to pebbles in the nose and another case reported by Linker, Rosenthal, and Golomb of a 17-month-old Negro child with profuse nasal discharge and weakness. Frequent irrigations brought a paper match stick out of one nostril. The child died from tetanus on the fifth day after admission.

GORDON, Philadelphia.

PYRIBENZAMINE IN THE TREATMENT OF NONSPECIFIC UPPER RESPIRATORY INFECTIONS. G. ARNOLD CRONK and F. N. MARTY, New York J. Med. **52**:579 (March 1) 1952.

Working at the Syracuse University Student Health Service, Cronk and Marty undertook to determine whether previously glowing accounts of "cure" of respiratory infections were trustworthy. Two hundred forty-five healthy young adults with acute upper respiratory infections less than 48 hours old were chosen and were given tripelennamine (pyribenzamine) hydrochloride in 50-mg. tablets, so that 200 mg. would be taken in 24 hours. The containers were marked "A." Another control placebo set marked "B" was given to 218 subjects. Not even the physicians in charge knew which was real and which was "Ersatz." The letters "A" and "B" were interchanged to avoid guessing. All patients were observed daily for

subjective and objective signs and symptoms. No other treatment was allowed. A significant number of "colds" involve allergies also and therefore respond to antihistamines. "More of the patients treated with Pyribenzamine Hydrochloride manifested subjective improvement than did the controls who received placebo. . . . In no instance is it asserted that the Pyribenzamine definitely cured an upper respiratory infection." Two Tables are shown, with the intention of drawing inferentials.

[In spite of this commendable effort, the reader cannot draw any positive conclusions as to the value of this study. Too many variables enter into it. In any case, an agent destructive to germs or viruses is not being dealt with. It is an old dictum that a symptomatic cure is in reality no cure at all. Moreover, who can say to what extent Nature is overcoming these infections, regardless of medication? Relief and shortening of the course of a cold are desirable, but for years there have been such agents, many of which have been helpful, if not curative.]

I. W. VOORHEES, New York.

LOSS OF SUBSTANCE FROM THE NASAL ALAE AND TIP. ROBERTO FARINA, Plast. & Reconstruct. Surg. **9**:52 (Jan.) 1952.

In the treatment in three cases of loss of tissue from the nasal tip and alae Farina followed the method described by Brown and associates, in which free composite grafts of skin and cartilage from the ear were used. Removal of sufficient material from the ear caused no noticeable deformity. The method is simple, the results are satisfactory, and the patient is not obligated to enter a hospital.

SELTZER, Philadelphia.

SECONDARY REPAIR OF UNILATERAL CLEFT LIP DEFORMITY: SQUARE FLAP TECHNIQUE. H. M. TRUSLER, Plast. & Reconstuct. Surg. **10**:83 (Aug.) 1952.

The cases reported in this article are all of persistent deformity after previous operation for cleft lip, in all cases due to inadequate surgery in the primary correction. Trusler's method is based upon that of LeMesurier (1949) and has been found particularly successful in unilateral harelip correction. One chief requirement for success in this operation is adequate width horizontally of the upper lip, and the fulness of the upper and lower lip should nearly correspond. If the upper lip is too tight in the beginning, the operation will not correct the deformity. In this case the lip should be lengthened horizontally. Age has not been found to be of importance, and success has been attained both in children and in adults. One condition is that operation should be delayed until the final result of the operation can be determined. Diagrams represent the steps of the technique by which the square flap is formed. Not only the skin surface of the lip is adjusted but also the inner surface, which should be made to correspond. Repair of the defect in the nostril floor must also be considered. About two weeks is needed for tissue repair. Trusler considers his technique superior, partly because of the broken line of the square flap, which prevents vertical contraction. Hyperplasia of the external scar can be controlled by the application of a small tape dressing over the scar, and, if needed, irradiation can be resorted to. The article is clearly illustrated and includes an adequate bibliography.

SELTZER, Philadelphia.

CORRECTION OF THE INTERNALLY AND EXTERNALLY DEVIATED NOSE. E. D. KING and F. L. ASHLEY, Plast. & Reconstruct. Surg. **10**:116 (Aug.) 1952.

King and Ashley review the difficulties usually experienced in straightening a deviated septum and nasal tip, a condition due to the elasticity of the cartilage. Comment is made upon the difficulties of submucous resection in this region. The anterior tip of the septal cartilage cannot be satisfactorily resected; removal of too much of the dorsal cartilage may cause a depression of the dorsal line. Many operations have shown that in many cases which have appeared to be successful the septum and the tip have a tendency to return to their original position. In 50 cases King and Ashley operated with a combined one-stage procedure. The technique is briefly outlined. The main point of difference from other methods is the complete intact removal of the septal cartilage, using scissors and a swivel knife. After careful trimming and straightening the cartilage is reintroduced into its bed and attached into the

columella with mattress sutures. If it is necessary to improve the nasal profile, a small strip of septal cartilage is embedded along the dorsum, under the skin and the subcutaneous tissues above the lower lateral cartilages. This procedure is followed by a routine rhinoplasty, with complete mobilization of the lower lateral cartilages and nasal bones. This method provides for a readjustment of the soft tissues of the nose to suit the new midline position of the nasal framework. Excellent preoperative and postoperative photographs show the outcome of the operations. Thirteen references to the literature are included.

SELTZER, Philadelphia.

LYMPHOBLASTIC SARCOMA OF THE INFERIOR TURBINATE. MARCEL GIGNOUX and JEAN GAILLARD, Ann. oto-laryng. **68**:176 (Feb.-March) 1951.

Two cases of lymphoblastic sarcoma of the nasal fossae located on the inferior turbinate in boys of 8 and 11 years of age are reported. Early diagnosis was possible in each case, the diagnosis depending upon the anatomicopathological examination. The sensitivity of these tumors to physical agents contraindicated dangerous surgical procedures. Transcutaneous irradiation must be performed by radium puncture of the primary lesion. X-ray therapy of the surrounding glandular structures must be performed. By physical therapy alone Gignoux and Gaillard obtained a 12-year cure in one case and an apparent cure of several months in their second case.

VIGLÉ, Los Angeles.

Miscellaneous

USE OF WETTING AGENTS IN THE TREATMENT OF RESPIRATORY INFECTIONS OF INFANTS. GLENN C. HALL JR., A. M. A. Am. J. Dis. Child. **83**:1 (Jan.) 1952.

The importance of moisture in acute respiratory infections has long been known. Steam produces hyperpyrexia in an already feverish infant. The University of Virginia Hospital began experiments with modern wetting agents in 1949. Four are listed: sodium lauryl sulfate (duponol C®); alkylaryl sulfonate (aerosol OS®); synthetic primary alcohol sulfate (tergitol O8®), and sulfonated ester of dicarboxylic acid (aerosol MA®). The first is a product of E. I. Dupont de Nemours and Company. The second and fourth are made by the American Cyanamid Company. Tergitol O8® is from the laboratories of Union Carbide and Carbon Corporation. They are not in production for clinical use as yet. Hall concerns himself with the toxicity of these compounds and found that it could be controlled by varying of the concentration, keeping it below 0.1%. Sodium lauryl sulfate was dissolved in distilled water to obtain a concentration of 0.05% and was placed in a "Croupette Humidity and Oxygen Tent." A fog formed, the density of which was controlled by the amount of oxygen flow. Three cases are reported, one of a 7-week-old infant and two of 3-year-old children. "Bronchiolitis" was the diagnosis in Case 1 (bacteriology not stated), and penicillin and aureomycin were tried, without results. Sodium lauryl sulfate in a croup tent with oxygen was administered. "Recovery was uneventful," In Case 2 the diagnosis was "laryngotracheobronchitis," and streptomycin and aureomycin were administered. The patient's condition became worse, and tracheotomy was considered. Sodium lauryl sulfate in a 0.05% solution was added to the Croupette Tent reservoir. "Convalescence was uneventful." Case 3 showed Corynebacterium diphtheriae in the throat, which resisted 30,000 units of diphtheria antitoxin plus penicillin. Tracheotomy was considered. Sodium lauryl sulfate was also administered as described above. "Recovery was uneventful." These wetting agents are recommended on an experimental basis in selected cases of exudative respiratory infections.

I. W. VOORHEES, New York.

THE THYROID AND THE NOSE. EDITORIAL, J. A. M. A. **149**:665 (June 14) 1952.

For several decades rhinologists and endocrinologists have been aware of the relation between thyroid deficiency and nasal disease. A series of patients had been studied by Proetz and others in whom conventional therapy to the nose failed to help. Basal metabolic studies invariably disclosed rates of —17.5 to —21.6%.

The administration of thyroid extract to the patients deficient in thyroid hormone was helpful.

Basal metabolic tests should be performed in cases of nasal disease with hard-to-manage conditions, and when the rate is low suitable doses of thyroid extract should be administered.

GORDON, Philadelphia.

INDICATIONS FOR TRACHEOTOMY IN BULBAR POLIOMYELITIS. EDITORIAL, J. A. M. A. **149:** 840 (June 28) 1952.

The preponderance of communications appearing in the world medical literature favors the use of tracheotomy in properly selected cases, though the criteria cannot be hard and fast. Each case is a law unto itself.

Of the utmost importance is the insurance of a proper constant supply of oxygen. Pharyngeal paralysis by itself is not a proper indication for tracheotomy.

Appropriate centers ought to be established for this important procedure in strategically located medical centers.

GORDON, Philadelphia.

THE FUTURE OF OTOLARYNGOLOGY. JOSEPH SHANKS, J. A. M. A. **149:**1156 (July 19) 1952.

Shanks, commenting on an editorial of the same name in the April 26 issue of *The Journal of the American Medical Association*, takes up the challenge by stating that the otolaryngologist has already integrated into his practice plastic and reconstructive surgery, as well as surgery of the head and neck.

The specialist can advance his surgical skill, unless he is handicapped by economic means, and those whose preference may lie in the nonsurgical phases of otolaryngology should study intensively the subjects of allergy, audiology, physical medicine, and psychosomatic medicine and should perfect themselves in the accurate use of the antimicrobial agents.

The future of otolaryngology is bright, and the specialty is sound, as evidenced by the number of papers and discussions in the various journals.

GORDON, Philadelphia.

MÉNIÈRE'S DISEASE AND ITS SURGICAL TREATMENT: REPORT OF 300 CASES. F. CASTELLANO, J. Neurosurg. **8:**173, 1951.

A series of 300 cases of Ménière's disease is presented, with a discussion of the etiologic factors, pathologic anatomy, symptoms, objective findings, detailed operative procedure, and follow-up studies. Castellano points out that surgical treatment is indicated in Ménière's disease (1) in all cases in which medical treatment has not produced improvement and (2) in cases in which the working capacity is impaired as a result of the severity of symptoms.

In 254 cases operation was performed. In 27 the acoustic nerve was completely sectioned; in 226 only the vestibular branch was divided; in 1 the nerve was freed from adhesions but was not sectioned.

Complete freedom from dizziness was obtained in all but eight cases; in seven of these eight cases the disease was bilateral. Tinnitus rarely disappeared. There was no operative mortality. Facial paralysis occurred in 16 cases, being transient in 14 and permanent in 2. Postoperative extradural hematoma occurred in five cases; in one of these an intracerebellar hematoma also occurred. Follow-up periods varied from a few months to 19 years.

ALPERS, Philadelphia, [A. M. A. ARCH. NEUROL. & PSYCHIAT.].

SPEECH DEVELOPMENT IN THE YOUNG CHILD: 1. THE AUTISM THEORY OF SPEECH DEVELOPMENT AND SOME CLINICAL APPLICATIONS. O. H. MOWRER, J. Speech & Hearing Disorders **17:**253 (Sept.) 1952.

When birds are taught to talk, it is necessary to develop an isolation of the bird from its species and to associate the vocalizations of human speech and song with pleasant experiences. A self-satisfaction basis of performance then develops in the birds because of the subjective comfort provided by these sounds. Psychoanalytically and psychologically the learning of

human babies may be dependent to a considerable extent on the reassuring and secondary reinforcement properties of a mother's voice, particularly as it is associated with agreeable experiences. A number of applications to speech pathology are suggested.

PALMER, Wichita, Kan.

RECENT ADVANCES IN THE SURGICAL TREATMENT OF FACIAL PARALYSIS AND BELL'S PALSY. JOSEPH A. SULLIVAN, Laryngoscope **62**:449 (May) 1952.

The subject of facial palsy is thoroughly dealt with in this article. Among the subjects discussed are the anatomy of the facial nerve and surrounding structures, the sites where the nerve is most frequently impaired, electrical reactions, the use of nerve grafts in the repair of injuries, and Bell's palsy, including the indications for surgery.

HITSCHLER, Philadelphia.

A NEW MIGRAINE THERAPY. EUGENE FOLDES, New York J. Med. **52**:1307 (May 15) 1952.

Foldes stresses the prevention of migraine rather than the termination of an attack, once it has started. He uses an "antiretentional diet" which is high in proteins and vitamins but low in carbohydrates, fats, liquids, and sodium chloride. But it was necessary to have an "alternate treatment," especially in the case of peptic ulcer in which frequent feedings of milk and carbohydrate-containing foods are necessary. Xanthine diuretics were administered, mainly aminophylline given orally, 0.2 gm. three times a day, or rectally in cases of gastric intolerance. By either route, the results seemed equally efficacious, with lessened frequency and duration of attacks and improvement in physical and emotional states. Based on the concept that disturbed metabolism as to intake of water and electrolytic influences is dominant in migraine, dietetic therapy has been applied for some years. This report concerns 3 out of 17 cases in which the history is detailed. A Table showing a summary of the cases sets forth excellent results in 12 cases, good results in 5, plus results recorded as "fair" in 2 cases. The best results were obtained when the dietetic regimen was maintained over a period of three months or more.

I. W. VOORHEES, New York.

PSYCHOSOMATIC APPROACH TO SINUS HEADACHE. CONRAD K. GALE, New York J. Med. **52**:1407 (June 1) 1952.

Gale states that less than 10% of the patients who complain of "sinus headache" have sinusitis. He thinks that too often the rhinologist accepts a ready-made diagnosis and that through "conditioning" by press, radio, and general conversation there is an idée fixe upon which the patient leans. A thorough diagnosis calls for x-ray examination and anterior and posterior rhinoscopy with a lighted nasopharyngoscope, based on a complete history in which questions are asked which may reveal a hidden psychic fixation. After certain infections the patient is left with neuralgia or neuritis which may closely simulate sinusitis. The possibility of histamine cephalalgia must also be considered.

Stress is placed on the psychologic approach after the physiologic, or somatic, study has been consistently determined. Two case reports show how difficult it may be to bring out factors of environment which disturb or distress the patient without his awareness that the cause may thus be set for his unhappiness and apparent physical disability. "The psychologic approach utilizes words as the most potent tool both for investigation and therapy." The causes of headache may be determined not only by physical means but also by an analysis of "the mind diseased." This theory is not new in the practice of medicine, but it constantly needs reaffirmation, since one may be so engrossed in the physics of diagnosis that the mental, or spiritual, or psychical, aspect is overlooked. These statements constitute the substance of Dr. Gale's excellent essay.

I. W. VOORHEES, New York.

FUNDAMENTAL CONCEPTS RELATING TO PATHOGENESIS OF CANCER. CORNELIUS P. RHOADS, New York J. Med. **52**:1640 (July 1) 1952.

The basic work for Rhoads's study was done at the Sloan-Kettering Institute and Cornell University Medical College, and the study was reported at the 146th Annual Meeting of the New York State Medical Society in New York City on May 16, 1952.

The "cause" of cancer is less of a mystery these days because several causes, such as x-rays, ionizing radiations, ultraviolet light, and many chemicals are known. One would wish to know more about the chemistry of the body, particularly of the endocrine system. Steroid hormones are formed in the adrenals, ovaries, and testes, and they bear a certain relation to tar, which is known to cause cancer in animals. Secondary sexual characters, the breast, uterus, and prostate for example, are strongly susceptible to control by the steroid hormones. The peaks of cancer incidence are at the ages of puberty and during the menopause. In experimental animals one can induce cancer by injection of a steroid hormone. Cancer of the breast or the prostate can be increased or diminished in growth up to a certain point by the administration of selected hormones or by the removal of the ovaries or testes. In children with acute leukemia, "cancer of the blood," cortisone will restrain the condition for a time, but then the leukemia becomes active again, leading to certain death. The "why" is not as yet apparent. Cancer of the breast rarely occurs in castrated women, and eunuchs do not have cancer of the prostate! In animals reduction of caloric intake tends to prevent cancer probably because of reduced activity of the endocrine system. Stimulation of the pituitary gland drives other endocrine glands to produce steroid hormones, with resulting neoplasms. Cancer during pregnancy is notoriously fatal, since hormone imbalance is at its highest level. The behavior of cancer in plants affords a curious observation, since cancer can be produced by growth hormones, such as indoleacetic extract. In animals the morphology of the endocrine glands is seriously changed in the presence of spontaneous or induced cancer, and an inherited tendency to acquire cancer can be correlated with the morphology of the endocrine glands. Further, in certain experimental animals, castration is followed by cancer of the adrenals or the breast, but it can be prevented by injection of pure hormones of gonadal origin. One must conclude that there is a shifting, or change, of the chemicals, or hormones, in the body due to unknown causes, but a study of the steroid hormones may yet help to solve certain problems. These studies are so complex that they seem endless because of the great variety of substances isolated thus far and of the many yet to be so isolated. It is a painstaking process.

Bodily excretions afford a field for intensive, but exceedingly difficult, study. So far it is known that each person has a constant pattern of steroid hormone excretion. This pattern will change, however, under certain conditions, such as dietary deficiency, disease, or aging of the person. Preliminary gleanings were developed from studies on persons with xeroderma pigmentosum and Paget's disease. Excreted hormones represent the "ash," or "burnt-out" end-products, after body metabolism, but how to find the originators of the ash is a most involved problem.

A result of great interest is that one can now predetermine the abnormalities of steroid excretion associated with cancer. It is not yet known how to prevent cancer by any experimental procedures, but the hope and a reasonable expectation of doing so are at least encouraging.

I. W. VOORHEES, New York.

NASAL TRIAD, NASAL ALLERGY, AND DEAFNESS. A. R. MILLER, Northwest. Med. **51**:302 (April) 1952.

It is not sufficiently recognized by members of the medical profession at large that a high percentage of deafness is caused by increased nasopharyngeal pressure. This increase of pressure is brought about by sneezing and blowing the nose when there is decreased nasal space for secretions. Three of the most important causes of decrease in nasal space are (1) adenoids, (2) deviation of the nasal septum, with compensatory hypertrophy of the turbinates, and (3) nasal allergy, with edematous swelling of the mucosa and polypoid formation of all degrees.

Miller emphasizes the importance of early correction of the causes of decreased nasal space by the removal of adenoids, the correction of the deviation of the nasal septum, and the treatment of nasal allergy with the removal of polyps, even if occurring early in childhood. Miller's conclusions are well described on the basis of the physiological mechanisms involved, and the anatomical pathology is well illustrated by diagrams and drawings.

DOCTOR, Seattle [A. M. A. AM. J. DIS. CHILD.].

NEW TECHNIQUE FOR HARELIP. A. D. CARDOSO, Plast. & Reconstruct. Surg. **10**:92 (Aug.) 1952.

The Cupid's bow of the upper lip is often disregarded in the operation for correction of harelip. Cardoso's method preserves this contour in a normal position without changing its lines. Line drawings and photographs illustrate the zig-zag incision in a series of cases which include both adults and children. The incision includes the full thickness of the lip, including the inner surface. The reports on the cases are said to be good, especially from the standpoint of creating a normal Cupid's bow. The presentation is brief and without references.

SELTZER, Philadelphia.

COMPOUND RIGHT ANGLE Z-PLASTY. E. HAZRATI, Plast. & Reconstruct. Surg. **10**:133 (Aug.) 1952.

This report from Iran deals with the subject of the effect of contraction of a linear scar upon the outcome of skin plastic operations. This effect can be largely obviated by changing the direction of the incision and consequently the scar in such a manner that there is lengthening of the site of contraction. The early (1856) history of the use of Z-plasty is reviewed, with examples of compound Z-plasty in cleft lip operations and elsewhere. One limitation of the earlier methods is the possible distortion of Langer's lines in the skin. Line drawings and details of the technique of both continuous and isolated Z-incisions are fully given. Advantage is claimed for compound Z-plasty in a long incision, without the necessity of making large skin flaps. It is also possible to change the direction of the scar without altering Langer's lines. The pattern does not change with time, and it keeps both parts firmly together. The illustrations make the technique clearer than is possible by any descriptive means, except at great length.

SELTZER, Philadelphia.

COMBINED NECK AND JAW RESECTION FOR INTRAORAL CARCINOMA. W. C. CARROLL, Surg., Gynec. & Obst. **94**:1 (Jan.) 1952.

It is suggested that carcinomas arising from the buccal mucosa near the lower gingival margin, the lower gingiva itself, the floor of the mouth, and the anterolateral two-thirds of the tongue be grouped together in the consideration of the treatment of intraoral cancer. Carroll feels that a preliminary course of radiation may be used to initiate therapy and that definitive surgery can then be carried out. The latter should consist of radical neck dissection, hemimandibulectomy, and partial glossectomy, all in continuity. In some carefully selected patients preliminary irradiation may be eliminated and direct surgical intervention effected. Since positive regional lymph nodes subsequently develop in a high percentage of patients after control of the primary lesion alone, prophylactic neck dissection at the time of original surgery is preferred to expectant management with its so-called therapeutic dissection when the nodes become definitely palpable.

FRIEDBERG, Chicago.

THE RESULTS OF RADICAL SURGICAL EXTIRPATION IN THE TREATMENT OF CARCINOMA OF THE ESOPHAGUS AND CARDIA. R. H. SWEET, Surg., Gynec. & Obst. **94**:46 (Jan.) 1952.

Sweet analyzes the results of resection and esophagogastric anastomosis in 254 cases of carcinoma of the esophagus and cardia for a 12-year period ended Jan. 1, 1951. Of the patients treated by resection and anastomosis there was some variation in the operative mortality, since in those whose growth was in the lower esophagus or at the cardia the operative mortality was 11.6%. When the tumor was in the midthoracic segment, with necessary anastomosis above the aortic arch, the operative mortality was 24.3%. Since carcinoma of the esophagus is oftenest a disease of elderly people, the age factor is pointed out as one cause of the relatively high postoperative mortality. In line with this, over 50% of the operative deaths were caused by cardiac failure.

Late-survival studies show that in carcinoma of the lower esophagus and cardia there was a five-year survival rate of 17.5%. When the growth lay in the midthoracic segment, the five-year survival rate was 4%. There was little significant difference in the five-year survival rate between patients whose tumor was classified as adenocarcinoma and those whose growth

was epidermoid. The presence or absence of lymph node metastases in the resected specimen proved of definite prognostic significance. The five-year survival rate in the negative node group of patients was 40%. When lymph nodes were involved, the five-year survival rate was 13.5%.

Sweet concludes that resection and anastomosis provide the best method of palliation of carcinoma of the esophagus and cardia available at the present time. The cure rate is sufficient to make the operation worth while for every patient whose condition offers a reasonable prospect of recovery.

FRIEDBERG, Chicago.

SURGICAL TREATMENT OF TRAUMATIC ESOPHAGEAL PERFORATION. W. WEISEL and F. RAINE, Surg., Gynec. & Obst. **94**:337 (March) 1952.

Weisel and Raine report their experience in treating seven patients with traumatic perforations of the esophagus in a two-year period. Each patient was operated upon as soon as the diagnosis was made, and the perforation was closed by suture. There was no mortality, and the morbidity was minimal.

The most important factor in arriving at a diagnosis of traumatic perforation of the esophagus is the consideration of the possibility of this lesion in any patient who has undergone esophageal instrumentation or probable ingestion of a foreign body and in whom either pain or respiratory symptoms develop thereafter. Weisel and Raine feel that extreme pain is the most important symptom and that roentgenograms of the chest showing pneumothorax, mediastinal widening, or emphysema confirm the diagnosis. If the presence of a perforation is uncertain, a swallow of iodized oil, U. S. P. (lipiodol®), should be given for diagnostic purposes.

The optimum time for closure should be within six hours of the accident, but closure may be successful even after an interval of 36 to 38 hours. All patients were treated by closure of the perforation, with drainage of the fascial or the pleural space, administration of antimicrobic drugs, and supportive therapy.

FRIEDBERG, Chicago.

PULMONARY SURGICAL SALVAGE BY BRONCHIAL RESECTION. P. S. GEBAUER, Surg., Gynec. & Obst. **94**:346 (March) 1952.

Gebauer reports five of seven cases of successful bronchial resection with anastomosis or repair, and he offers this report as an illustration of the usefulness of the procedure in salvaging undamaged pulmonary lobes or segments. When the tracheobronchial lesion is favorable, the method of resection and anastomosis is preferable to the use of wire-supported dermal grafts. The two methods together are applicable to most of the deformities that are likely to be encountered, including obstructive lesions of the thoracic air passages, which have been previously regarded as therapeutic problems.

FRIEDBERG, Chicago.

ABNORMALITIES OF THE CALORIC TEST RESULTS IN CERTAIN VARIETIES OF MENTAL DISORDER. C. S. HALLPIKE, M. SPENCER HARRISON, and ELIOT SLATER, Acta oto-laryng. **39**:151 (June) 1951.

The introduction of Hallpike, Harrison, and Slater to this subject dates to the last war, when they investigated motion sickness in various service personnel. They established a caloric test technique for this work. They found that these were a high number of abnormal responses. They were as frequent in those who did not suffer from motion sickness as in those who did. They were, therefore, a function of flying. Subsequent to this time Fitzgerald and Stengel studied abnormal vestibular responses in schizophrenia. Variations noted included, foremost, general loss of reactivity, in some marked hypersensitivity, and in others directional preponderance and breakdown of nystagmus, with abolition of the quick component. These variations suggested an organic disorder, possibly biochemical. The authors noted Blumenthal's work with the use of epinephrine in animals to suppress caloric responses. This indicated the possible effect of prolonged stimulation of the sympathetic nervous system. Therefore, it seemed logical to examine cases of anxiety neurosis and to determine the caloric responses. Thirty-five such cases were studied, and 93 RAF cadets were used as controls.

The tests were done with the use of the technique of Fitzgerald and Hallpike (1942). Patients were tested in the supine position with the head raised 30 degrees. The external auditory meatuses were douched for 40 seconds, with a cold stimulus at 30 C. and a hot stimulus at 44 C. Water, 400 to 600 cc., was used. As the temperatures were equidistant from body heat, equal reactions were anticipated. Second-degree nystagmus (eyes straight ahead) was used. The magnitude of reaction excluded the latent period and was used as the time interval between the application of stimulus and the end of response. Normal and pathological responses were diagrammed. In the normal responses cold reactions had a value of 120 seconds and hot reactions a value of 100 seconds. Thus could be recorded the sum of reactions, total sensitivity, the difference between hot and cold responses, the difference between left and right responses, and directional preponderance, normally zero.

Directional preponderance may result from lesions of the labyrinth or the eighth nerve and characteristically favors nystagmus to the unaffected side. This is due to lesions of the utricle or utricular nerve fibers. In these conditions and in Ménière's disease recorded results may be arranged to form algebraic summations. Total sensitivity, cold-hot sensitivity difference, left-right sensitivity difference, and directional preponderance are recorded. These are studied by the standard statistical method with the use of the Gaussian frequency-distribution curve and, where applicable, a Pearsonian equation.

Results and comment upon the findings are as follows: In the normal group of controls the average values for directional preponderance and for left-right sensitivity difference approximate zero, and the standard deviations are slight. These findings indicate that the diagnostic significance which the authors have used has a reasonable statistical basis. In the neurotic subjects there is a greater over-all sensitivity and a greater degree of variance of response. Thus, contrary to the expectations of the experiment, rather than suppression of responses there has been exaggerated activity. There is an increase of deep reflexes and some other reflexes in anxiety states, and this may form part of this pattern. Variance (Slater) is a characteristic of many intellectual and physical attributes of neurotics, and the variance in caloric response could fit this general pattern.

ROBERT LEWY, Chicago.

STOMATITIS NICOTINA. FINN BOYSEN, Acta oto-laryng. (Supp.) **95**:20 (June) 1950.

There is such a phenomenon as tobacco stomatitis, even though rarely mentioned in textbooks owing to lack of familiarity. It is a rare condition. The mucous membrane of the hard palate in the described cases has a gray cast and is duller than in the normal. There are scattered small nodules of the size of a grain in the affected area. Biopsy study of the tissues involved reveals several layers of horny epithelium. Below this layer is an infiltration indicative of chronic inflammation of lymphocytes, granulocytes, and plasma cells.

ROBERT LEWY, Chicago.

Directory of Otolaryngological Societies *

INTERNATIONAL

Fifth International Congress of Oto-Rhino-Laryngo-Broncho-Esophagology

Place: Amsterdam. Netherlands. Time: June 8-13, 1953.
President: Prof. Dr. Eelco Huizinga.
General Secretary: W. H. Struben, Viottastraat 1, Amsterdam-Z
Scientific Secretaries: Dr. J. Bijtel and Dr. P. G. Gerlings.

International Congress of Audiology

Place: Leyden, Netherlands. Time: June 5-6, 1953.
General Secretary: Dr. H. C. Huizing, 182 Oostersingel, Groningen, Holland.

International Course in Paedo-Audiology

Place: Groningen, Netherlands. Time: June 1-4, 1953.
General Secretary: Dr. H. C. Huizing, 182 Oostersingel, Groningen, Holland.

Pan American Association of Oto-Rhino-Laryngology and Broncho-Esophagology

Meeting: Fourth Pan-American Congress of Oto-Rhino-Laryngology and Broncho-Esophagology.
Place: México, D. F., Mexico. Time: January, 1954.
President: Dr. Justo Alonso.
Exec. Secretary: Dr. Chevalier Jackson, 1901 Walnut St., Philadelphia 3, Pa.
President of Congress: Dr. Ricardo Tapia Acuna.

Third Latin-American Congress of Otorhinolaryngology and Bronchoesophagology

Place: Caracas, Venezuela. Time: 1953.

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Dean Lierle, Iowa City.
Secretary: Dr. Sam H. Sanders, 1089 Madison Ave., Memphis 3.
Place: San Francisco.

American Academy of Ophthalmology and Otolaryngology

President: Dr. James Milton Robb, 315 Lakeland Ave., Grosse Pointe 30, Mich.
Executive Secretary-Treasurer: Dr. William L. Benedict, 100-1st Ave. Bldg., Rochester, Minn.
Place: Palmer House, Chicago. Time: Oct. 11-17, 1952.

American Board of Otolaryngology

Secretary: Dr. Dean M. Lierle, University Hospitals, Iowa City.
Place: Roosevelt Hotel, New Orleans. Time: April 21-25, 1953.

American Broncho-Esophagological Association

President: Dr. Fred W. Dixon, 1027 Rose Bldg., Cleveland.
Secretary: Dr. Edwin N. Broyles, 1100 N. Charles St., Baltimore 1.
Place: Roosevelt Hotel, New Orleans. Time: April 28-29, 1953.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.

American Laryngological Association

President: Dr. H. Marshall Taylor, 111 W. Adams St., Jacksonville, Fla.
Secretary: Dr. Louis H. Clerf, 128 S. 10th St., Philadelphia 7.
Place: Roosevelt Hotel, New Orleans. Time: April 26-27, 1953.

American Laryngological, Rhinological and Otological Society, Inc.

President: Dr. Francis E. LeJeune, 49 Audubon Blvd., New Orleans 18.
Secretary: Dr. C. Stewart Nash, 708 Medical Arts Bldg., Rochester 7, N. Y.
Place: Roosevelt Hotel, New Orleans. Time: April 28-30, 1953.

SECTIONS:

Eastern.—Chairman: Dr. Irl H. Blaisdell, 202 Greenwood Pl., Syracuse 10, N. Y.
Place: Hotel Syracuse, Syracuse, N. Y. Time: Jan. 7, 1953.
Southern.—Chairman: Dr. W. W. Wilkerson, Jr., Curtiswood Lane, Nashville 4, Tenn
Place: Andrew Jackson Hotel, Nashville, Tenn. Time: Jan. 12, 1953.
Middle.—Chairman: Dr. Henry L. Williams, 818 4th St., S. W., Rochester, Minn.
Place: The Drake, Chicago. Time: Jan. 19, 1953.
Western.—Chairman: Dr. Alden H. Miller, 4000 Woking Way, Los Angeles 27.
Place: The Elks Club, Los Angeles. Time: Jan. 24, 1953.

American Otological Society, Inc.

President: Dr. Albert C. Furstenberg, 201 S. Main St., Ann Arbor, Mich.
Secretary-Treasurer: Dr. John R. Lindsay, 950 E. 59th St., Chicago.
Place: Roosevelt Hotel, New Orleans. Time: May 1-2, 1953.

American Otorhinologic Society for the Advancement of Plastic and Reconstructive Surgery, Inc.

President: Dr. Benjamin H. Shuster, 1824 Pine St., Philadelphia.
Secretary: Dr. Louis Joel Feit, 50 Park Ave., New York 16.

American Society of Ophthalmologic and Otolaryngologic Allergy

President: Dr. William H. Evans, 24 Wick Ave., Youngstown 3, Ohio.
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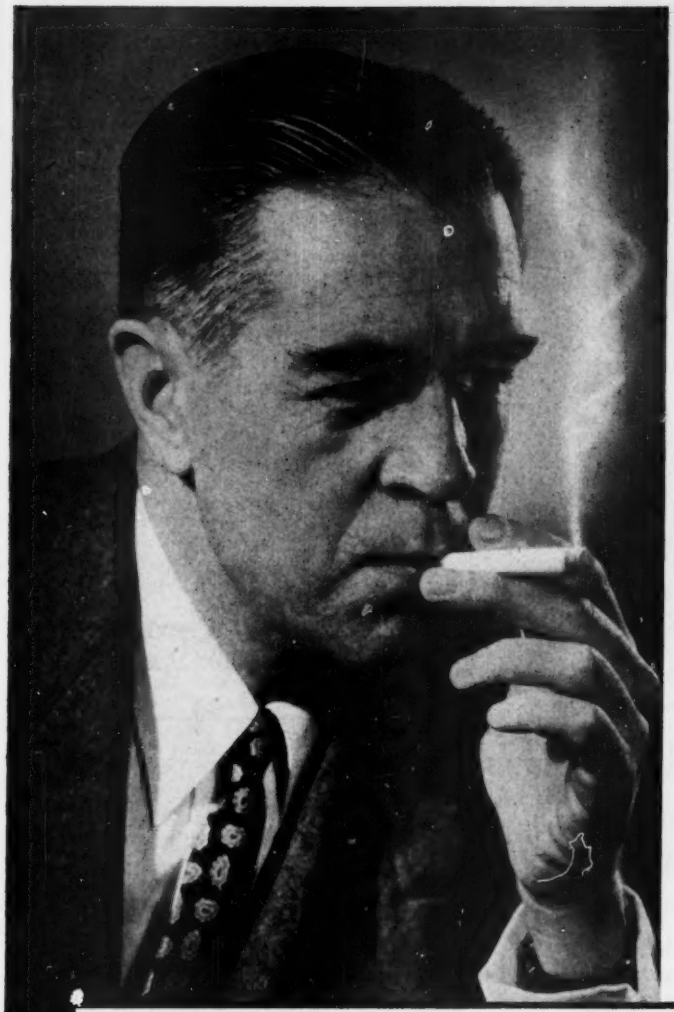

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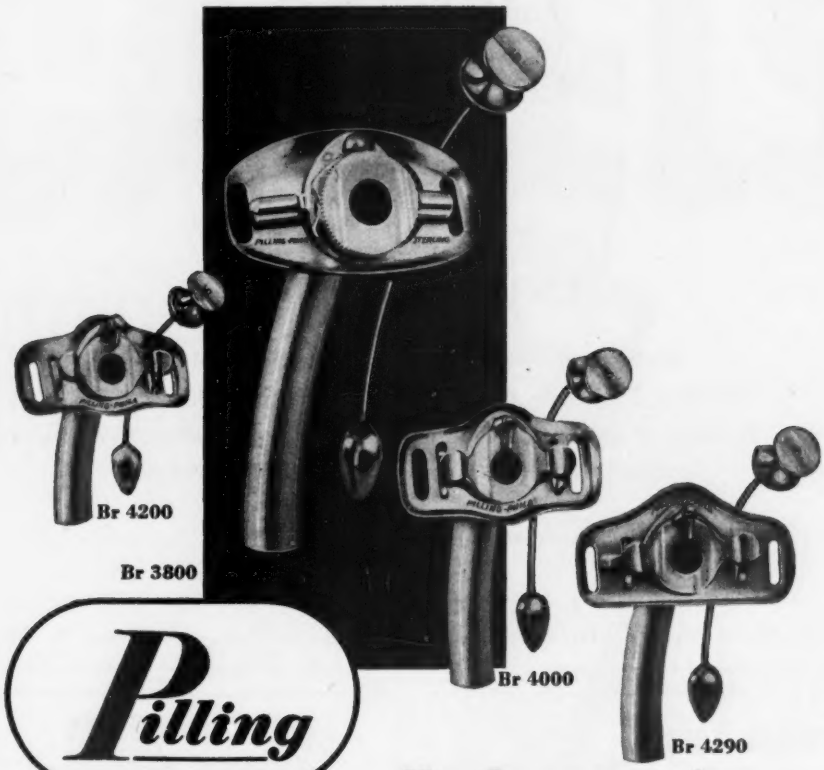

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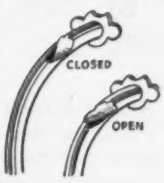

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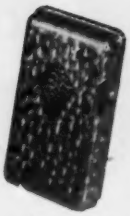

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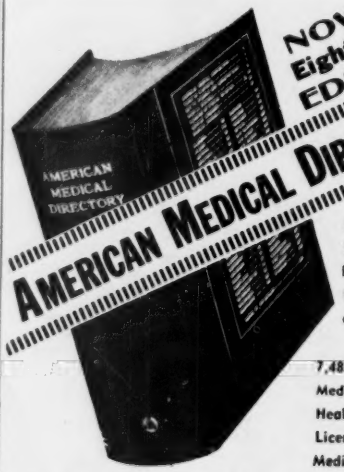

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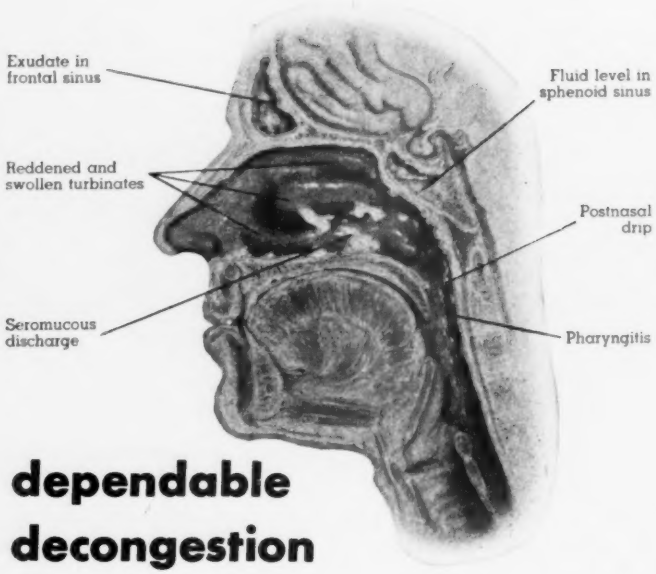

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